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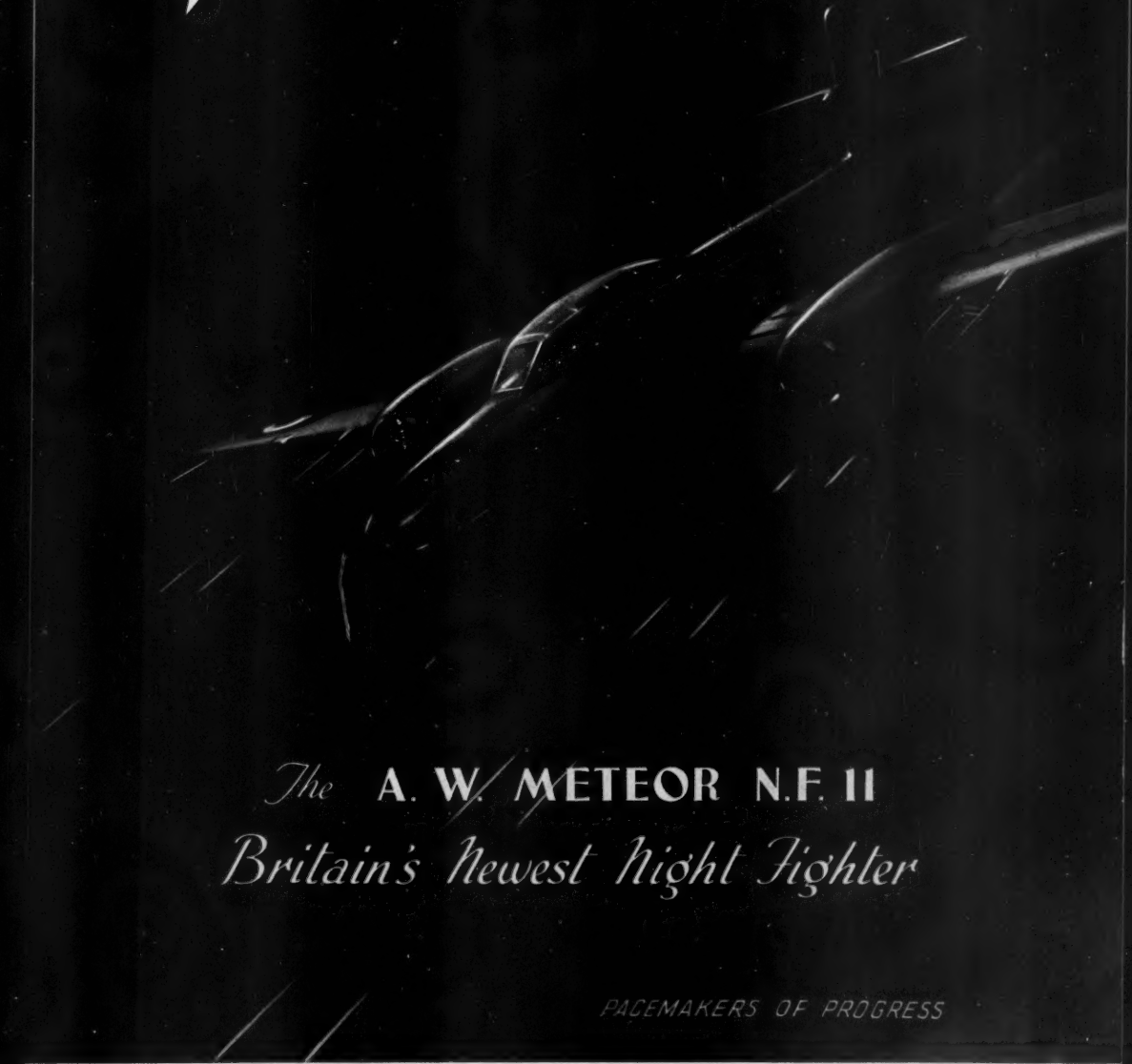

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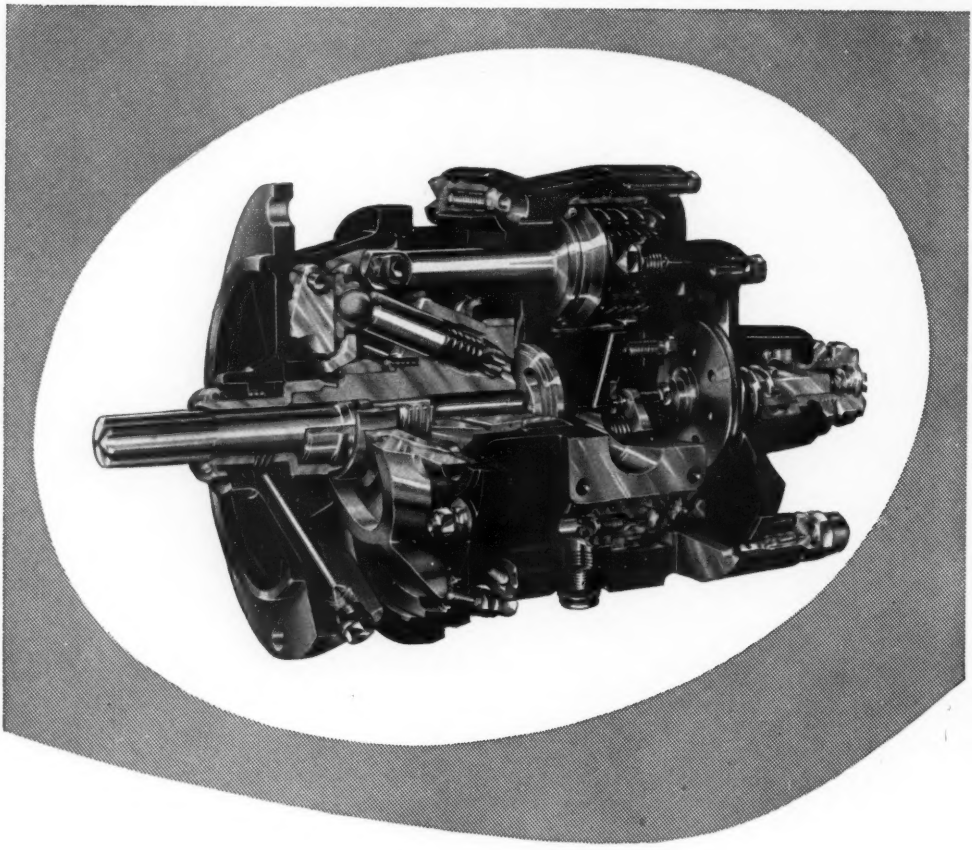

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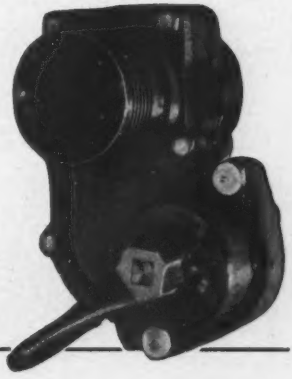

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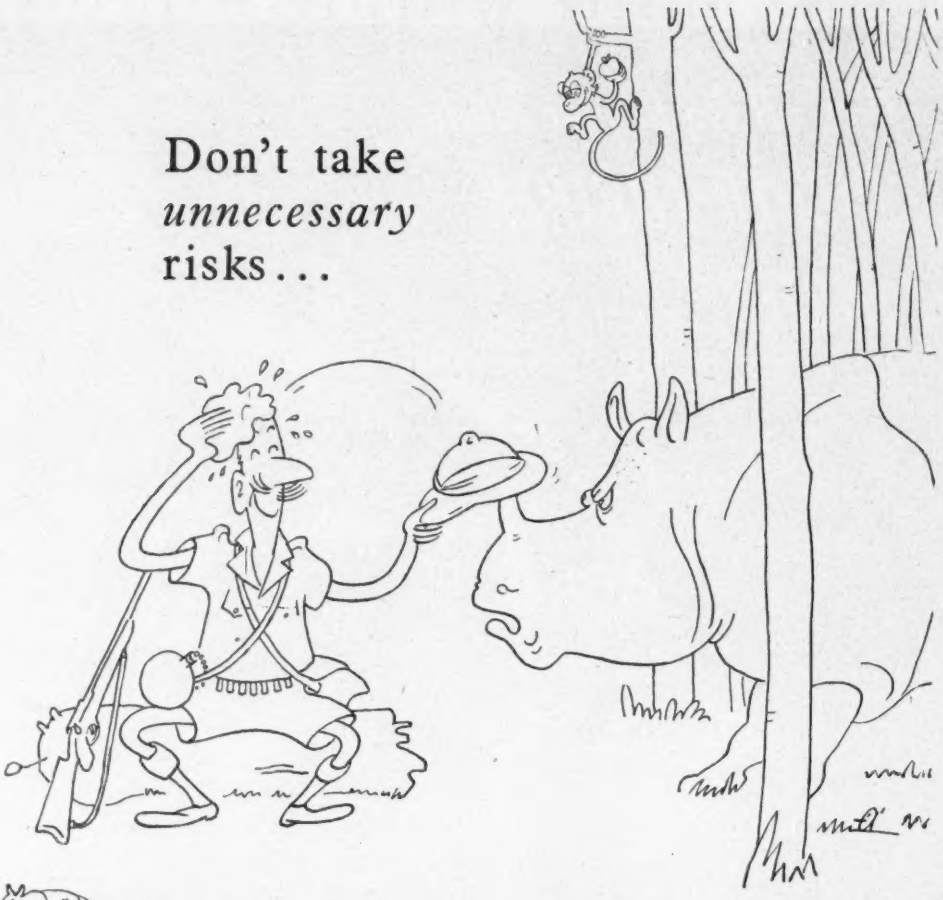

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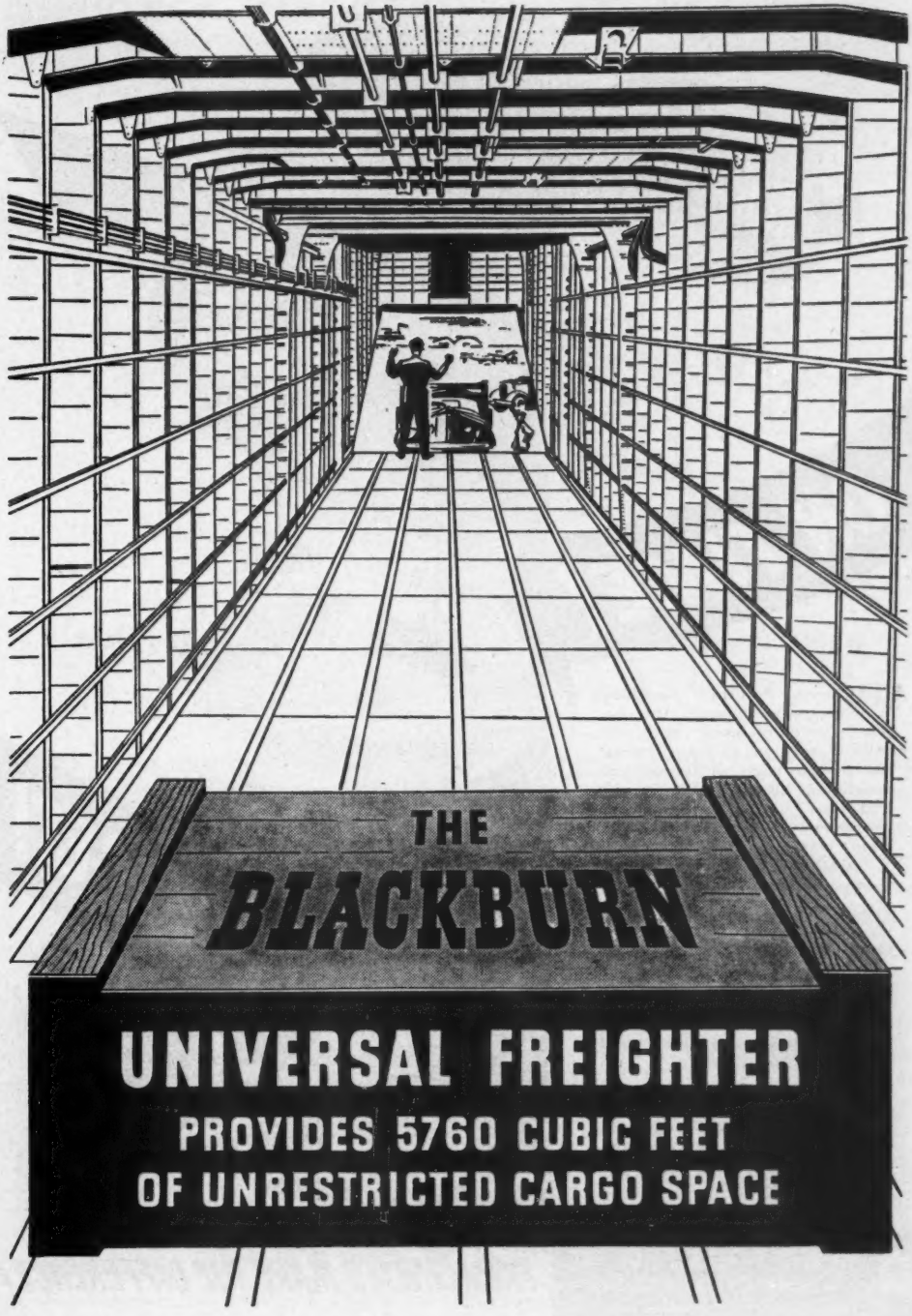
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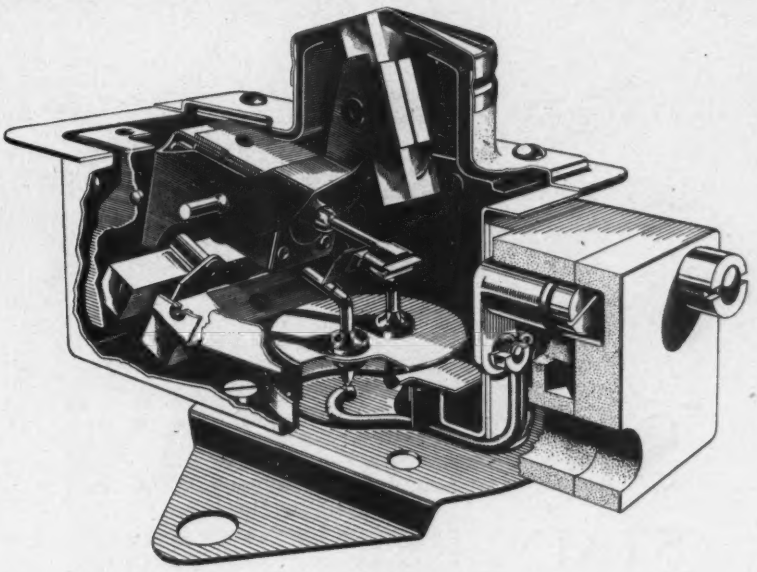

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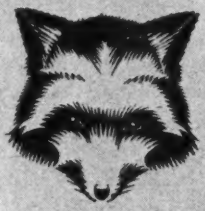

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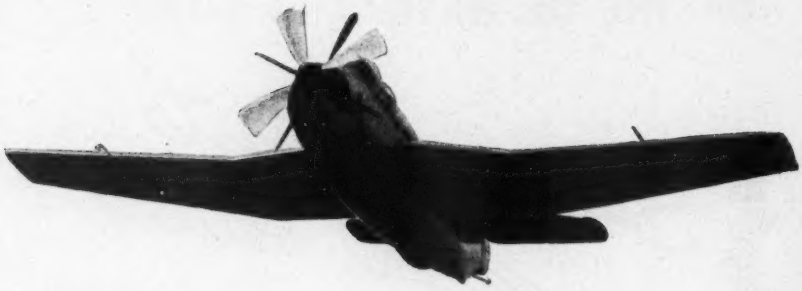

'SINGLE DRAG'
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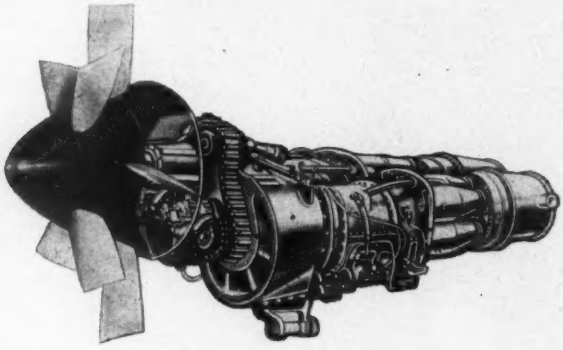

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Worthy Descendants

IN the period immediately preceding the Hitler war, and even more during its opening stages, the names of the Spitfire and Hurricane could be depended upon to give encouragement to the people on these islands and to call forth profound respect from the enemy. During recent months, air battles in Korea have indicated that there is probably but a single Allied fighter in service that can match the speed and climb of the Russian adversaries. Admittedly these are not the only qualities which make up a fighter's operational efficiency, but they are of prime importance.

What of today? We were happy to be able to comment last week on the promise of several new fighter types, and now we can announce the first flight of another superlative example—the Supermarine F.1 Swift with Rolls-Royce Avon axial turbojet. Thus once again we have a Hawker and a Supermarine fighter, each one of which is as far in advance of anything the enemy may put up as, in their time, were their illustrious forebears.

This pair have in common another most important feature concerned with their breeding. Both are the outcome of a line of post-war prototypes in which steady progression has been apparent. Most important among the stages in development was the adoption of swept-back wings. The significance of this progressive method is that although both the Swift and the P.1067 are newly fledged prototypes, so much has been learned about them in advance of their first flights that production orders can be placed with confidence without waiting for a demonstration of the performance capabilities of these aircraft.

Thus, in order, Venoms, Swifts, and 1067s will soon pass into squadron service, and there are indications that more new types are following close behind. Astronomical expenditure in pounds or dollars cannot buy back lost time; but at last, it seems, we are at the beginning of the end of an uncomfortable period of inadequate air defences.

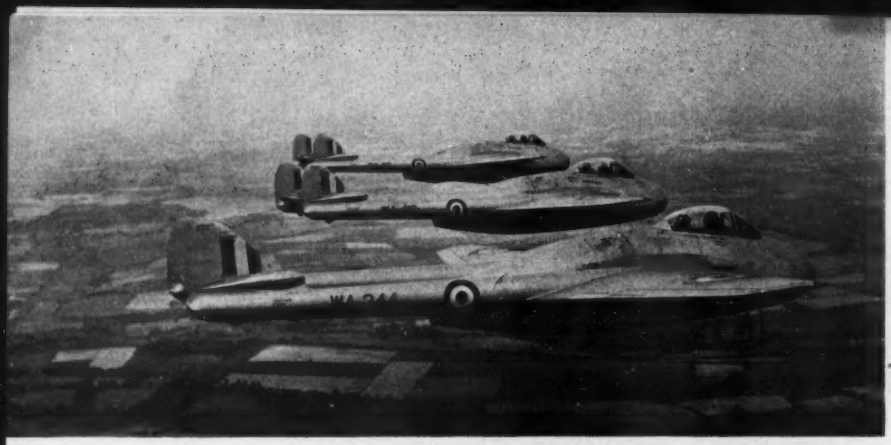
Tax on Progress

WHEN bad weather caused abandonment of the King's Cup and other National Races at Hatfield on June 23rd everyone fully expected that a way would be found to run them later in the year. It was officially hoped that Saturday, September 15th, the first public day of the Farnborough Display and Exhibition, would offer the ideal opportunity, the whole of the public arrangements being ready-made as it were. But no: the Commissioners of Customs and Excise indicated that they would want a cut of the gate money, and such a cut that the whole idea suddenly lost its sparkle. Although the programme would still have been given over primarily to an exhibition of new British civil and military aircraft for the public who pay for them, the inclusion of a single race would entail an entertainment tax levy of no less than 42 per cent on that day's gate money.

As the principal organizer of air races in this country, the Royal Aero Club has, of course, run into this sort of thing before. Even if a loss is made on an air race meeting—and this is by no means infrequent—the tax must still be paid. To be fair, the Customs and Excise people have little choice in the application of the law and, in general, they have not been unco-operative in the past. It is believed that the M.C.A. is also sympathetic.

Our reason for mentioning again the taxation of air racing is to lead up to a plea—voicing the opinion of every air-minded man and woman in the country—for a change in the law.

Of the four main reasons given by the Royal Aero Club (see page 175 of last week's issue) for regarding the law as unfair, we single out but one for emphasis: "Air races are primarily organized for the encouragement of airmindedness and aviation development." No one can doubt the truth of this assertion, for prize money is seldom sufficient to cover expenses, while the organizers are lucky to break even on costs and takings, even though nearly all the work is done on an honorary basis. On aviation development we would draw attention to the remarkable improvement of some of the regularly competing aircraft as indicated by their pre-war speeds compared with those achieved recently. The experience, know-how and enthusiasm behind such development are national assets.



Formation exercises are important items both in the Spitfire and the Vampire schedules.

REFRESHING EXPERIENCE

Holiday Atmosphere at a Service Flying School: A Visit to No. 102 F.R.S.

LAST week we visited R.A.F. Station, North Luffenham, near Oakham, Rutland, until recently a Transport Command station, but now the home of No. 102 Flying Refresher School. One hesitates to make a pun, but visiting the School genuinely was a refreshing experience: everyone was happy and quite evidently enjoying himself, and although all the men on the course have to work fairly hard, the work is chiefly flying and, in that all of them are flying enthusiasts, the total effect is to give the station an aura of happiness and keenness which is exceedingly rare.

No. 102 F.R.S. is one of the units of the newly-formed No. 25 Group, Flying Training Command, which controls advanced flying schools and was established to help cater for the large intake of pupil-pilots required under the R.A.F. expansion programme. Commanded by G/C. R. A. Ramsay Rae, O.B.E., North Luffenham, together with No. 103 F.R.S. at Full Sutton, near York, has the task of providing an intensive flying refresher course for members of the R.A.F. Volunteer Reserve who have been called back into the Service for a three months' period of continuous training.

The whole three months is, however, not spent at North Luffenham or Full Sutton. Before going to either of these Schools, the recalled "V.R." spends six weeks at Oakington or Ternhill, where he puts in 40 hours on Harvards. Having become thoroughly familiar with something a bit bigger and heavier than a Tiger or Chipmunk, the man then goes to North Luffenham or Full Sutton for the remaining six weeks of his three months. On arrival, he is given a routine dual check on a Harvard, and then goes into No. 1 Squadron (S/L. B. J. Jennings, D.F.M.) which is equipped with Spitfire 22s. He spends three weeks in No. 1 Squadron, during which time he has to put in 20 hours on the Spitfire, and then transfers to No. 2 Squadron (S/L. I. D. Bourne) for the final three weeks; No. 2 is equipped with Vampire 5s, and each pupil is required to do 15 hours in these aircraft.

The aim of the Flying Refresher School is to ensure that pilots know the basic facts of the flying technique and engine handling of jet aircraft and, in addition, possess a working knowledge of radio aids, current R/T procedures, and Fighter Command methods of control. It is, of course, not possible in so short a period as six weeks to train the V.R. pilots up to full operational standard. No gunnery training is given, neither do the pupils fly at night. What the School does—and, apparently, does exceedingly well—is to provide an intermediate step toward first-line squadron standard. Not all of the pupils are ex-fighter pilots—although, naturally, these predominate—but no matter whether wartime experience was with heavies, mediums, fighters or boats, each student seems equally enthusiastic about flying jet aircraft.

Each squadron is divided into two flights, and as a result of the intensive nature of the course, flying starts at about 0630 hr and continues until as late as 2100 hr. To this end, the flights work in 24-hour relays; that is to say, Flight A will, for example, fly from 1200 today until 2100 tonight, and again from 0630 tomorrow morning until 1200 tomorrow, whereupon the aircraft will be taken over by Flight B for a similar cycle. The patent efficiency of the flying organization is in no small measure due to the C.O. of the Flying Wing, W/C. C. D. Tomalin, D.F.C., A.F.C.

Whilst in the Spitfire squadron, the student carries out 12 exercises as follows: familiarization—climbs and descents, turns stalling, circuits and landings, one hour; circuits, landings and overshoots, one hour; applied circuits—short take-offs and landings, bad-weather circuits, flapless landings, one hour; stalling, steep turning, G.C.I. fixes, map reading, QGHs (two sorties) two hours; climb to 15,000ft., steep turns and aerobatics (two sorties) two hours; precision flying clear hood, G.C.A., one hour; climb to 25,000ft., steep turns and aerobatics (two sorties), two hours; instrument/cloud flying, one hour; low-flying, one hour; low-level cross-country (maximum height 500ft), one hour; medium-level cross-country at 15,000ft. to land and refuel away from base, two hours; formation at various altitudes (five sorties), five hours.

To complement the flying training, each pupil attends lectures to a total of 19¾ hours. In addition, it is required that each student should put in a minimum of four hours on the Link trainer.

The detail of air exercises for the Vampire squadron is essentially similar to that undertaken by the Spitfires, but the sortie time is somewhat reduced. The exercises are: familiarization—climbs and descents, turns, stalling, engine handling, circuits and landings, 40 minutes; circuits, landings, rollers and overshoots, 40 minutes; applied circuits—glide approaches, flapless landings, bad-weather circuits, 40 minutes; climbs to various altitudes, aerobatics, steep turns to Mach 0.7 (four sorties) two hours 40 minutes; climb to 30,000ft., steep turns, QGHs (two sorties),

The men who flew the aircraft in the top picture: F/O L. S. T. Scoltock, F/L. T. Williamson (instructor) and F/O. D. K. A. Bradshaw.

climb to 30,000ft., speed runs, maximum rate descents to 10,000ft., aerobatics (two sorties), 1 hour 20 minutes; speed runs at 5,000ft., 40 minutes; familiarization with long-range tanks—climb to 30,000ft., G.C.I. fixes, G.C.A.s (two sorties), two hours; cross-country at 30,000ft (land and refuel away), 1 hour 40 minutes; formation (four sorties), 2 hours 40 minutes. In addition to these exercises, each pilot may have to put in three hours' dual checks on the Harvard as required.

There is an overlap of three weeks between successive courses. For example, at the time of our visit, No. 2 course were completing their training on Vampires, and No. 3 course were just finishing with Spitfires. Last Monday, No. 3 course transferred to Vampires, and the newly arrived No. 4 course started on Spits. There are, nominally, 36 students in each course (although this is subject to slight variation) and, therefore, the total functional task of the School in terms of flying hours per six-week period is impressive; it is, in fact, just over 3,000 hours. The School has 32 Spitfires and 24 Vampires plus a couple of Meteor 7s. The Meteors serve a twofold purpose: they can be used to give preliminary dual instruction to those pupils who, it is thought, might benefit from it before going off in a Vampire: they also serve as a means of familiarizing the students with some of the phenomena associated with high-speed flight (shock stalls, for example) so that the man can recognise these effects and take the appropriate action when by himself in a Vampire.

It is, of course, rather too early as yet to come to a hard and fast conclusion about the Flying Refresher Schools. To all intents and purposes, if North Luffenham is anything to go by, they would seem to be a success. Certainly, the idea is good, so good in fact that extension to a wider field might well be worthwhile. At the moment, however, there exists no follow-up flying training for the men who have completed the Refresher School course. Flying Command, no doubt, is fully alive to the situation and, we imagine, something will be sorted out before very long.

EQUIPMENT OF THE R.A.F.

Some Pertinent Questions During the Recent Debate in the Commons

BRIEF reference was made last week, under the heading "Commons Discuss R.A.F. Equipment," to the important debate on Royal Air Force equipment which took place in Parliament immediately before the summer recess. The first speaker was A. Cdre. Harvey, who said that the Opposition was glad to have an opportunity to debate equipment in the R.A.F. There had been a lengthy debate earlier in the year dealing with the Air Estimates, but many had felt that a number of questions had not been adequately or sufficiently answered on that occasion. He went on to express a belief that there were insufficient transport aircraft in the R.A.F. In the spring of last year, the Government had thought fit to cancel the orders for transport aircraft with Handley Page and the Vickers company as a means of economy. The Opposition had not agreed because they had felt that for a country with a comparatively small number of men under arms it was vital to be able to move them, if necessary, to all parts of the world at the quickest possible speed.

Only recently, when the Airborne Brigade had moved to Cyprus, they had travelled in an aircraft carrier or two. A. Cdre. Harvey, wondered what the Russians and the Persians had really thought of that manœuvre. This great Power, Britain, had wanted to move a comparatively small number of men to the Eastern Mediterranean, and had taken ten days to do so. The Air Commodore said that we could not afford to allow soldiers, sailors and airmen to spend weeks and weeks aboard troopships in carrying out their postings.

Many men were only in the Service for two years. Approximately three months of that time could be saved either for service or for additional training, were they to travel by air on all occasions. There had been no alternative during the war but to accept American transport aircraft.

The Air Commodore said that work on the Vickers Valetta and the Handley Page Hastings was almost completed, and it was only a question of weeks before the jigs would be dismantled. If we were to have aircraft quickly, it was essential to place contracts reasonably soon, even for existing types. We had been told months ago that we should have a number of auxiliary transport squadrons. So far we knew of one. The others were under consideration. Why was that matter taking so long to consider when we needed these squadrons desperately? He went on to say that he would like the Minister to clarify the position about the suggestion that we might obtain some Fairchild Packets; also some information about United States jet fighters. The only information which the Air Commodore had was from the *New York Times* of July 29th. He then quoted a paragraph which was written by Mr. Beniamin Welles, the London correspondent. Referring to the American Sabre fighter, he had written :—

"Britain has been seeking for months to obtain about 400 Sabre fighters to tide over the Royal Air Force until its own two new jets, the Supermarine F.1 Swift and Hawker F.3 [P.1067] can come into production. Both of these planes are rated highly, but neither will be available in strength before 1953."

A. Cdre. Harvey said that they all knew that newspaper correspondents could be inaccurate, and they (the Opposition) would like to know what the Minister had to say on this subject. They had been told at the end of last year that the Chief of the Air Staff, Sir John Slessor, was going to Washington to discuss the problem of the R.A.F. obtaining Sabre fighters. It was now August 1st and still the country knew nothing about this project at all.

They understood from the Press that a statement had been made by General Vandenberg that neither this country nor America had a fighter aircraft in service which was comparable to the Mig-15. The Air Commodore said that he was concerned as to what the performance of the Mig-15 really was.

After congratulating the manufacturers and test pilot of the Hawker P.1067 on its first flight, the Air Commodore asked when the aircraft would be in the squadrons. Meteors and Vampires, which had given excellent service, were not new aircraft in design, but were rapidly becoming out-of-date so far as performance was concerned. The Opposition would also like to know, concerning the Sabre aircraft, whether the armament was satisfactory, because it was no good having an aircraft that could climb to 45,000ft in a very short time if it had not got sufficient armament to do the job when it got there. Was it intended to fit British armament, or to re-design that part of the aircraft?

A. Cdre. Harvey said that another subject which ought to be discussed was that of trainers; they would like to know whether the Vampire two-seater was being considered as an intermediate trainer, because, if so, the Opposition thought that would be an admirable step forward.

Mr. Arthur Henderson, Secretary of State for Air, referring first to the subject of transport aircraft, said that orders which had been placed had been related to the maximum production capacity of the aircraft industry of the country. Orders had already been placed for aircraft and ancillary equipment exceeding an amount of £500 million. When the number of squadrons in relation to Transport Command had been fixed, the Government had borne in mind the reserve potential that could be obtained from civil aviation. In an emergency they would look upon the available transport resources as comprising not only of the front long-range and medium-range transport squadrons of the R.A.F., but also the aircraft of the Corporation and the various charter companies. It was quite untrue to say that the Parachute Brigade were sent to Cyprus in an aircraft carrier because the R.A.F. were unable to move them by air. They had not been asked to do so.

The Minister stated that what the Air Ministry would like to do was to replace the long-range aircraft, such as the Hastings, with jet aircraft. He did not wish to commit either the Ministry of Supply or himself, but it might be that one of the new four-jet bombers would be the type of aircraft which could be developed for transport purposes. It might be that something on the lines of the Comet would meet the case. But they had not yet made up their minds, and the experts at the Air Ministry were at the moment considering what would be the best type of four-jet aircraft to replace the Hastings.

"In our view," he said, "we have sufficient reserves of Hastings for some years to come, but we cannot use those aircraft for some purposes owing to the fact that tail loading facilities did not exist in them. If we had to obtain—as we might well do—a number of the American C-119s to which A. Cdre. Harvey has referred. it would be because those aircraft had the facilities we required immediately, possibly as an interim measure, for the conveyance of troops."

A. Cdre. Harvey had asked if these aircraft would be a gift, and to this the Minister replied in the affirmative, saying that no charge would be made for them as in the case of the F-86s. Regarding the supply of F-86s, the Minister said that we could not compel the Americans to do anything in the matter. They were themselves launched on a great rearmament programme. The Air Ministry was having discussions with them, but the Americans had not yet indicated whether or not they would provide these aircraft. If they did, they would be additional to the vast orders for aircraft which we had placed in this country. In other words, they would not be in substitution for any aircraft ordered over here. Indeed, had there been no possibility of obtaining these machines from America, not a single additional aircraft would have been added to

EQUIPMENT OF THE R.A.F. . . .

the vast orders which had been placed during the last six months.

Regarding bombers, Mr. Henderson went on to say that according to the information supplied to him, the Valiant, the new four-jet-engined bomber now flying, would be superior to the Canberra in range, speed, altitude and load-carrying capacity, and it was believed it would give our country the lead in the field of heavy jet bombers. As to the new fighter to which the Air Commodore had referred—the new Hawker interceptor type—which had successfully carried out its first flight, this aircraft was designed not only to deal with any bomber likely to be in service for some time to come but to be faster and have a higher performance than the Russian Mig-15 or the American F-86.

Referring to a previous statement he had made regarding the Vampire trainer, Mr. Henderson said that they did not look upon it officially as an intermediate trainer. The question arose whether we should have an intermediate trainer; there was a difference of opinion.

With regard to the concern which had been expressed about the absence of the Chipmunk, the Minister said that the Air Ministry was not satisfied; they had not the number they would like, but if there had been no expansion programme the number ordered two years ago would have been adequate. He thought that the House would agree with the importance of giving priority to Regular flying schools.

MR. PROFUMO, the next speaker, accused the Air Ministry of being guilty of "seeking to fob off the Army with a second-rate tactical transport aircraft." Second, they had jeopardized the future of the British aircraft industry; and, third, their policy tended to make us dangerously dependent on the U.S.A. The Army required two classes of transports: a "strategic" long-range aircraft which was able to carry troops, stores and equipment over considerable distances, and a shorter-range "tactical" type from which men and equipment could be parachuted, which would operate from makeshift landing strips and which, therefore, required low take-off and landing speeds. That the R.A.F. had no "tactical" transports was no fault of the British aircraft industry.

MR. HENDERSON, replying, said that the Air Ministry was not prepared to give an order [off the board] involving perhaps many millions of pounds except in a very grave emergency—such as they had done in the case of the Canberra and the F.3 and the B.9. In the case of the transport aircraft to which Mr. Profumo had referred, the Blackburn company had a prototype flying and trials were now being carried out. The Ministry was not prepared to order until the results were known.

MR. PROFUMO then asked if we were permanently to depend on the U.S.A. to supply this sort of aircraft. He then explained that there were two types of Packet: the C-82, with an all-up weight of 54,000 lb, and the rather more modern C-119, which he thought had an all-up weight of 74,000 lb. In his opinion it was likely that we should be offered the older type from reserve stocks.

Although the C-82 was better than nothing, it did not to any appreciable extent meet the requirements of the Army. It could not be landed on most grass fields and it needed a long runway both for landing and taking off. He then went on to quote from a comparison in *Aviation Report* between the Fairchild Packet and British types:—

> "If ever there was an acid test of aircraft practicability it was there for all to see at Abingdon. Three different types of military transport aircraft were lined up for the Army—the Fairchild C-82 Packet, the Handley Page Hastings and the Blackburn General Universal Freighter. The Army produced a load of heavy equipment. They wanted to see how each of them would take it to Watchfield, unload it, then reload it and fly it back. Watchfield is a small grass field. The Hastings and Packet did not attempt the operation. The Freighter sailed gently into Watchfield with its load, sat down in 300 yards and disgorged it. In due course it flew the load out and back to Abingdon."

His information was that the Universal Freighter was so good that within the last four months the U.S. authorities had been making inquiries about it for their own Services. Here was an aircraft which might easily accompany the Canberra into production for the U.S.A.F., but the Ministry of Supply had stopped work on the second prototype and no production order had been placed at all.

We had become far too dependent upon resources from the other side of the Atlantic for far too much equipment for our own British Air Force —fighters, bombers, and now transports. This meant that Parliament had no longer any real control over our defences.

MR. W. J. TAYLOR said that he wished to put in a modest plea for aircraft for the Flying Scholarship Scheme, which was sponsored by the Association of British Aero Clubs. He wanted Tiger Moths made available to the flying clubs, free or at a nominal charge.

W/C. BULLUS supported Mr. Taylor's request. A year ago, the Minister had stated that he was not satisfied with the number and calibre of aircrew entrants. Was he satisfied today? Harvards, in use in 1939, were still in use and not a single Balliol had yet been in service in our training schools, apart from a few used in Fighter Command for air-firing training. If the side-by-side-seat dual Vampire were brought into general use, it would mean economy of effort and production.

In regard to Reserve Command, the Government had been constantly pressed for the past three years to provide an advanced trainer. When would these reserve schools have adequate aircraft?

W/C. BULLUS then asked whether it was likely that the Brabazon I and II would be taken over for trooping.

MR. P. B. LUCAS thought that some of the accidents now occurring among jet pilots were the result of their having had unsuitable aircraft on which to learn to fly. It was an easy matter to convert an experienced pilot from piston-engined to jet-engined aircraft, which in many ways were simpler to fly. But the inexperienced pilot found himself faced with speeds of 400 or 500 m.p.h. and more; flying an aircraft which at low altitudes might run out of fuel in 50 minutes; and controlling one which, on account of its high wing-loading, allowed little latitude for handling errors which were expected at that stage of his training.

Mr. Henderson had indicated that the Vampire was to be modified for side-by-side dual control: this was a step in the right direction and was a further tribute to the genius, initiative and enterprise of the great British de Havilland Aircraft Company. But he did not think that merely by taking front-line aircraft and fitting them with two seats instead of one, we should get an intermediate jet trainer of an adequate type.

In the course of the next few years, we should witness the advent of faster, higher-powered and more complicated aircraft into the squadrons. The F.3, the F.4 and B.9 would far surpass in performance—and, incidentally, in expense—any comparable aircraft with which they were now equipped. We were preparing to equip the squadrons with these exceptional aircraft without first providing adequate trainers on which pilots might gain knowledge, proficiency and confidence. The Dutch, on the other hand, were showing imagination in the production of their advanced trainer—the Fokker S.14—with its lower wing-loading and longer endurance.

Mr. Lucas said he was thinking in terms of an easy intermediate trainer, of lower wing-loading and of longer endurance, to which a pilot might be converted after only 20 or 30 hours of basic training on a light aircraft. After 180 or 200 hours or so on the intermediate, a pilot would be better equipped to tackle the Vampires and Meteors.

Turning to the subject of ejector seats, Mr. Lucas said that, as a result of courageous planning and pioneering, the seat manufactured by the Martin-Baker Aircraft Company—which, so far as he was aware, was the only make to be supplied to the R.A.F.—afforded a very much wider measure of safety to the pilot.

After referring to the seat fitted to the Hawker P.1081 in which S/L. Wade lost his life—one "not of Martin-Baker manufacture but of a type never before subjected to live testing"—Mr. Lucas said that the 30 or more live-test ejections which had been undertaken by the Martin-Baker company had directly resulted in the incorporation of two essential modifications. Mr. Lucas' information was that these vital modifications were not, and are not, embodied in the type of seat which was fitted to S/L. Wade's aircraft.

When, on April 30th, the Minister of Supply had been questioned upon this matter, he had replied that live testing of ejection seats was not a requirement of his Department. The fact that six days after raising this matter in the House—namely, on May 6th—a seat similar to that used by S/L. Wade was removed from an experimental Westland Wyvern aircraft and a Martin-Baker seat substituted, was, he thought, sufficient testimony to the value attributed in certain quarters to live testing.

Mr. Lucas asked the Minister to give an undertaking that no ejection seat would ever be accepted by the R.A.F. which had not first been subjected to a series of prolonged and searching tests such as those which had been undertaken with such infinite resolution by Mr. Lynch, the parachutist of the Martin-Baker Aircraft Co.

Wanted: A Balanced Force

MR. GEORGE WARD spoke next. He said he must make it clear that the Opposition believed that we ought to have a balanced force of our own; we could not rely on any foreign power, however friendly, to provide us exclusively with any one type of aircraft. He believed that we should have our own British-made, balanced Air Force, with British aircraft performing every duty in it, whether it was a large or small force.

Mr. Ward said that there seemed to be no sense of urgency about getting on with this plan of building up a balanced force.

Only that day the Secretary of State for Air had said that the fastest jet fighter in the world today was the American Sabre and the second fastest the Mig-15.

Today we had no very fast modern fighters in our squadrons, we were begging the U.S. to come to our help with some Sabres, and nothing seemed to be happening.

In Bomber Command once again we found ourselves relying on the Americans for Washingtons. He believed that the policy of trying to produce a new jet bomber instead of a new stop-gap piston-engined bomber was right. But if we accepted that policy—as we did—surely the next step to take was to say: "These things cannot be built overnight; therefore, we must apply a sense of urgency to them as we have never applied a sense of urgency before." How was it that we had ordered only twenty or so of the new Vickers 660?

Turning to Coastal Command, Mr. Ward said that we had heard of these 300 fast modern submarines possessed by the Russians. What were we doing about that? We were waiting hopefully for the U.S. to give us Neptunes.

On the subject of Reserve schools, Mr. Ward asked: how could we expect our pilots to train on aircraft 25 years old?

The Secretary of State had said that the Blackburn Freighter was still doing trials and that they were not yet prepared to order any of them. That was very weak indeed; the first prototype of the Blackburn Freighter had been flying for over a year; they must know something about it by now. The second had been cancelled altogether. Why?

Mr. Ward said that he had recently had an opportunity to observe Exercise *Ombrelle*. He thought that all who had seen it agreed that the warning system was by no means perfect. The other thing noticed was that there were no G.C.A. facilities whatever to get pilots down in thick weather. This would mean that our fighter defences in North Europe were absolutely useless in any sort of thick weather.

MR. AIDAN CRAWLEY, Under-Secretary of State for Air, was the next speaker. Dealing with points raised in the debate, he said that the Air Ministry was about to invite three more charter companies to form three more auxiliary squadrons, and that would bring the number of reserve transport squadrons up to four in the near future.

Regarding Tiger Moths for the A.T.C., Mr. Crawley said that at the moment they had a Service use for all the Moths we had; but, as the Chipmunks came into use, they might have some Tiger Moths available.

Asked about the first photographic reconnaissance squadron to have modern aircraft, Mr. Crawley thought it would be equipped by next spring with the Canberra.

It had been suggested, went on Mr. Crawley, that the R.A.F. accident-rate was increasing alarmingly. The facts were otherwise. With the amount of flying increasing enormously, the accident rate per number of hours flown was staying almost the exactly same. The number of accidents per hours flown on jet aircraft was not only going down, but was well below what it was with Spitfires.

FROM ALL QUARTERS

A SAMPLE DELIVERED: Taken by a "Flight" reader on August 5th, this photograph shows the Lyneham-Melbourne Canberra on arrival at Darwin. As recorded last week, it made the 12,677-mile delivery flight in under 25½ hours' air time. With others, it will give the R.A.A.F. experience before the Australian Canberras emerge.

Centaurus for Universal Freighter?

CONSIDERATION has been given to the possibility of installing four Bristol Centaurus 171 engines in place of the present Hercules in the Blackburn and General aircraft Type 60 Freighter. It would then become the Mk 2 and would show an increase in gross weight from 105,000 lb to 127,000 lb and in maximum speed from 175 m.p.h. to 200 m.p.h.

In a brochure setting out details of the proposed Type 60 Mk 2 a new arrangement for rear loading doors and tail is disclosed. The doors would be of the clamshell type, streamlined in form and meeting on the aircraft centre line. A tubular tail boom would replace the present loading ramp and rear fuselage.

Experience with the Hercules-powered prototype has indicated that the Mk 2 could operate from grass fields and maintain the necessary performance and payload figures, with wing loading increased from the present 36 lb/sq ft to 43.5 lb/sq ft. Bogie landing gear and braking airscrews play an important part in making this possible.

D. L. Hollis Williams Joins Westland

WE hear that Mr. D. L. Hollis Williams, B.Sc., F.R.Ae.S., has been appointed chief engineer to Westland Aircraft, Ltd., Yeovil, and will have a seat on the board.

Previously Mr. Hollis Williams had occupied a similar post with the Fairey Aviation Co., Ltd., from 1943 onwards. After serving in the R.F.C. and R.N.A.S. in the First World War he joined Hawker Aircraft, Ltd.; from 1924 to 1934, he was with the Fairey Company, becoming its chief designer. He spent the next eight years as chief engineer to General Aircraft, Ltd., and then rejoined Fairey's. In 1932 he was awarded the R.Ae.S. Silver Medal, for research into long-range flying.

J. G. Willis Leaves A. V. Roe

MR. J. G. WILLIS, A.F.R.Ae.S., A.F.I.A.S., informs us that he has relinquished his position as assistant chief designer of A. V. Roe and Co., Ltd., and, after a short holiday, is to take another technical appointment in the near future.

Mr. Willis's association with the company began at Hamble some 26 years ago, and, with the exception of the war period, he has been with them ever since. Prior to his resignation he was concerned with design and development of the delta-wing project.

A Canberra by any other name . . .

APPARENTLY, officials in Washington have been troubled by the position of the accentuated syllable, or syllables, in the name "Canberra." General Rawlings, deputy chief of staff of the U.S.A.F., is said to have suggested the solution of "pronouncing" it B-57 (the American designation). Mr. Mahon, chairman of the Appropriations Committee of the U.S. House of Representatives, has recently stated that in America "there is a high degree of appreciation of the Canberra," and in answer to a question, General Rawings confirmed for him that it is now in production in America and will be used as a light bomber.

According to *Aviation Week*, our American contemporary, some comments on the relative speeds of the XB-51 and the Canberra have been leaking out, and they indicate that the XB-51 is about 100 m.p.h. faster than the British bomber. That it is faster, with its three turbojets, small-area swept wings and design accent on speed at all costs, we can believe; but considering the disproportionate amount of thrust needed to gain even 10 m.p.h. extra speed in the 600 m.p.h. class, we feel that this particular figure must be a bit exaggerated at any height. It may be pertinent to mention that W/C. Cuming, who recently took a Canberra to Australia, is reported to have said that the highest speed reached during the flight was 580 m.p.h. This was between El Adem and Iraq, and may, of course, have been a ground-speed figure. He was, however, reported as adding that this was a cruising speed and the aircraft had not been "pushed."

It would be very interesting, incidentally, to see what average speed the Canberra will achieve on its forthcoming second direct North Atlantic flight. It is likely that it will be considerably faster than on the first occasion when S/L. Callard and crew made the delivery flight to the Martin plant at Baltimore. It is understood that W/C. Beamont will be the pilot on the next occasion.

Turboprop Opportunities

THE placing of future orders for certain American transports, such as the DC-6, Convair 340 and the Martin 4-0-4, is likely to be affected by a recent decision to curtail future distribution of the Pratt and Whitney R-2800 engines with which these machines are fitted. In making this decision, P. and W. have been influenced by heavy military demands and by the fact that existing commercial orders have already absorbed production capacity until June 1953. One possible effect will be that the conversion of these aircraft to turboprop power will come sooner than originally expected.

On the subject of turboprops, incidentally, it is learned also that Rolls-Royce, Ltd., have agreed to undertake, during the initial test period, all overhauls of the Darts which power B.E.A.'s Viscounts. In this way the manufacturers will be able to keep a close watch on the performance of individual components and will be in a better position to detect any design-weaknesses.

Gipsy Queens in the Ambrosinis

IT is hardly surprising that spectators at Shoreham on August 6th had difficulty in distinguishing one Ambrosini S.7, described in the race programme as Alfa-Romeo-powered, from the other with Gipsy Queen, for, in fact, both were identical and both had 225 h.p. Alfas. The Gipsy Queen 30 (250 h.p.) version could not, it seems, be got ready in time.

A new version of the Ambrosini, with Queen 70, is due to fly on September 1st. Data for this are: normal weight, 3,850 lb; maximum speed at 6,000ft, 270 m.p.h.; ceiling, 23,000ft; climb to 20,000ft, 20 minutes; cruising endurance, 3 hr 20 min; maximum dive speed, 425 m.p.h.

FORTHCOMING EVENTS

Aug.	12-18.	International Air Circuit of Switzerland.
Aug.	18-19.	U.S. National Air Races, Detroit.
Aug.	19.	Yorkshire Aeroplane Club: "At Home" (sponsored by A.B.A.C.).
Aug.	25.	Exeter Aero Club: Display.
Aug.	25-26.	Skegness Airport: Aerial Week-end.
Aug.	25-26.	International Air Circuit of the Dolomites, Italy.
Aug.	31.	Helicopter Association: "Operational Employment of the Piasecki Helicopter," by F. N. Piasecki. Lecture followed by Fifth Annual Dinner.
Sept.	1.	R.N. Air Stations Gosport and Lee-on-Solent: Air Display.
Sept.	2.	A.B.A.C. Summer Convention.
Sept.	3-7.	R.Ae.S. and LAe.S.: Third Anglo-American Aeronautical Conference, Brighton.
Sept.	3-8.	British Interplanetary Society: International Congress on Astronautics.
Sept.	5-6.	Aerodrome Owners' Association: Annual Conference, Bristol.
Sept.	9.	Society of Model Aeronautical Engineers (Northern Area): Model Flying Festival
Sept.	10.	R.Ae.S.: 39th Wilbur Wright Memorial Lecture—"The Well-tempered Aircraft," by A. E. Raymond.
Sept.	10-16.	Battle of Britain Week.
Sept.	11-16.	S.B.A.C.: Flying Display and Exhibition, Farnborough.
Sept.	15-16.	International Rally, Parme, Biarritz, France.
Sept.	22.	*Daily Express* South Coast Air Race, Shoreham.
Sept.	25.	Milan International Grand Prix.
Oct.	4.	R.Ae.S.: Seventh British Commonwealth and Empire Lecture, "Air Transport in New Zealand and the South Pacific," by A. V-M. Sir L. M. Isitt, R.N.Z.A.F.
Oct.	16.	Northamptonshire Aero Club: Annual Ball.
Oct.	31.	R.Ae.C.: Jubilee Ball.

HERE AND THERE

B-47 Distance Record

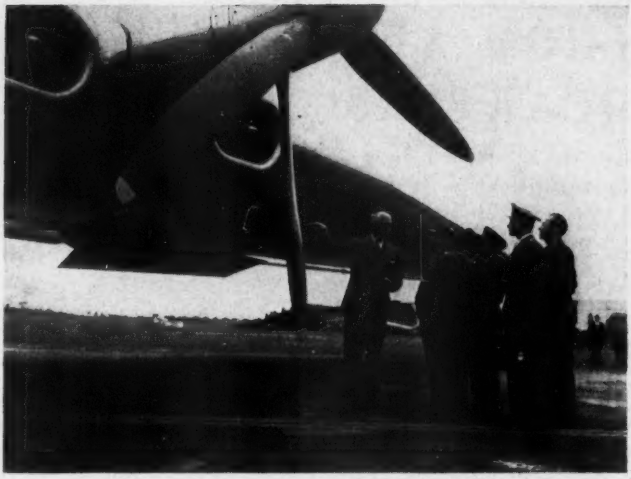
A U.S.A.F. B-47 recently flew 2,800 miles from Fairbanks, Alaska, to Wichita, Kansas, the greatest distance yet announced for a flight by one of these six-turbojet bombers. The object of the journey was officially quoted as being "to collect long-range cruise-control data." The flight was completed in 5 hr 36 min (almost exactly 500 m.p.h.).

Military Jet Route?

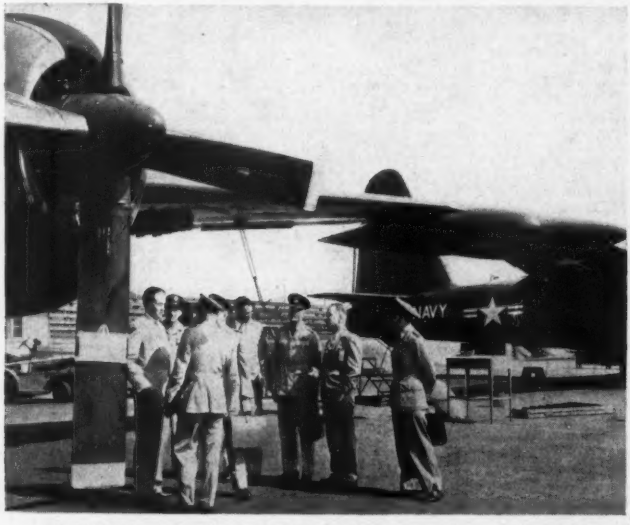
AN R.A.F. Valetta recently made a survey flight from the Suez Canal Zone to Pretoria and back, flying over Egypt, the Sudan, Kenya, and Northern and Southern Rhodesia. The purpose of the 8,500-mile flight was to examine facilities on a route which might be used by jet aircraft. Some of the landing-grounds visited were of a very undeveloped type, operated almost entirely by natives. Among the Valetta's passengers were the officer commanding a Vampire squadron in the Canal Zone and Capt. K. C. Kuhlmann, D.F.C., of the S.A.A.F.

Piasecki Lecture

MR. F. N. PIASECKI, chairman of the Piasecki Helicopter Corporation, is to lecture before the Helicopter Association of Great Britain on Friday, August 31st (5.30 p.m.), at the Institution of Civil Engineers, Great George Street, London, S.W.1. His subject will be *The Operational Employment of the Piasecki Helicopter*, and much of the paper will be devoted to the large transport type of rototating-wing aircraft, of which the successful Piasecki tandem-rotor PV-14 is an outstanding example. In view of the big attendance expected, non-members of the Association will be admitted by ticket only, obtainable on application to the assistant secretary at Londonderry House, 19, Park Lane, London, W.1. Following the lecture, and also at Londonderry House, the Association is holding its fifth annual dinner.



HERE . . . Twenty-five staff officers of the Turkish Air Academy visited the Bristol Works at Filton last week. Here Mr. C. F. Uwins (managing director, aircraft division) is seen explaining Brabazon features to Lt.-Gen. Menjuc and other members of the party.



. . . AND THERE: An R.A.F. delegation visiting the U.S.A. in connection with the acquisition of P2V-5s recently inspected some of the aircraft at the Lockheed works. Among them are G/C.s R. J. Carvell and L. P. Moore, W/C. F. C. de la P. Beresford-Peirse and S/L. R. S. Boast, all from Coastal Command, and S/L. J. C. Cracroft-Rice, who is Assistant Director of Equipment with the British Joint Services Mission in Washington. Later, R.A.F. crews are to visit the works.

Model Flying at Radlett

RADLETT airfield is to be used (by permission of Sir Frederick Handley Page) for the sixth annual rally of the St. Albans Model Aero Club, to be held next Sunday, August 19th. In the past, representatives of over 100 model clubs have attended this event. The meeting begins at 11 a.m., and public admission is 1s.

New U.S.A.F. Bomber

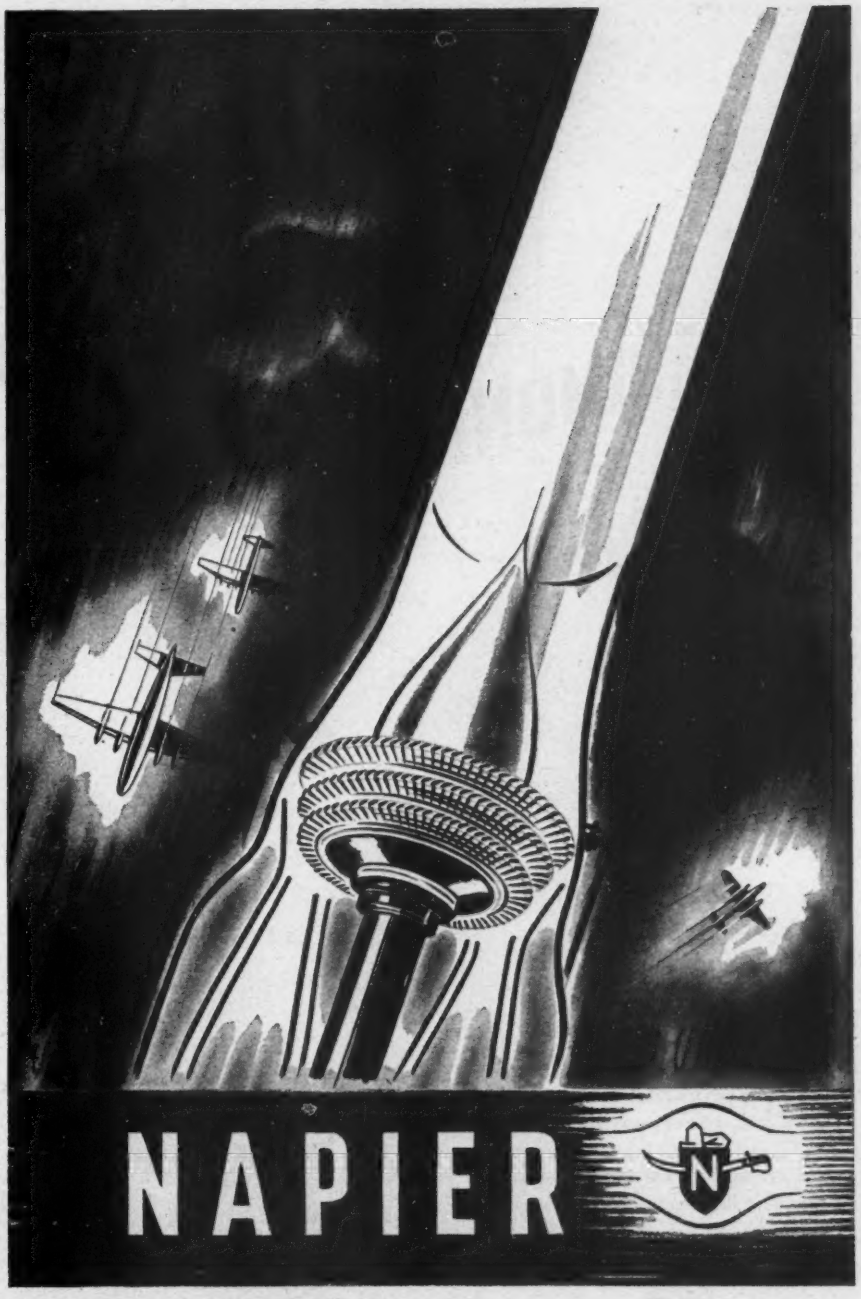
THE swept-wing heavy bomber to be produced for the U.S.A.F. by the Consolidated Vultee Co. is reported to be designated YB-60. It will be powered by eight turbojets. Although this aircraft is a development of the B-36D (which has six piston engines and four turbojets), it is said to have been given this advanced designation by reason of its dissimilarity and superior performance. At present only one prototype is to be built.

Defensive and Offensive

A BERLIN correspondent reports that an underground aircraft factory at Herold, near Chemnitz, started in 1943 by the Junkers company, has recently been completed by the Russians and equipped for the construction of Mig aircraft. The same correspondent reports that "great numbers" of Mig-15 fighters are now stationed in the area surrounding the Peenemünde guided-missile establishment, there being some 250 on two airfields alone. He also says that the airfield of Brand-Briesen is now being prepared to handle big aircraft such as the Tu-4, this being the first intimation that bases are being prepared for strategic bombers in the Soviet Zone of Germany.

Rocket's 130-mile Climb

A GLENN MARTIN Viking rocket fired at the White Sands (New Mexico) proving ground on August 7th reached an altitude of 135 miles. This is 21 miles higher than the previous maximum attained by a single-stage rocket, a German A-4 ("V.2") fired during experiments at White Sands in 1946. It also exceeds by 28.6 miles the height reached by another Viking, fired



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ASYMMETRIC LOAD: A Meteor 8 flying under conditions which would have shaken an earlier generation of designers and pilots—namely, with a single 1,000 lb bomb under the starboard wing. Such a contingency might arise from a "hang-up" or from unevenly emptied drop tanks.

HERE AND THERE . . .

from a ship in the Pacific. Slightly shorter than the A-4, and of only half its diameter, the Viking weighs about 11,000 lb. During the test on August 7th it was in the air for ten minutes and reached an estimated maximum speed of 4,100 m.p.h., descending 41 miles from the launching-point.

Sabres for U.S.A.F. in Britain

WITH the impending addition of a wing of F-86 Sabres to the F-84 Thunderjets already here, the fighter strength of the U.S.A.F. in this country will approximate to a total of 150. The 81st Fighter Interception wing, shortly to arrive, will be based at Bentwaters and Shepherd's Grove, Suffolk.

Mounted Police—New Version

IN the report of the Commission of Inquiry appointed to investigate last December's Singapore riots, Maj. Gen. Dermott Dunlop, who was G.O.C. Singapore at the time, is quoted as giving evidence as to the value of helicopters for controlling riots. He said that aircraft of this type not only produced a marked psychological effect by hovering over the heads of rioters but, with a military or police officer on board with tear gas grenades, could be a very effective instrument for the dispersal of such mobs. One one occasion, on December 12th, a police officer in a helicopter dropped one tear-gas grenade over about 30 rioters, who immediately dispersed.

Reconnaissance Thunderjet

A RECONNAISSANCE development of the Republic Thunderjet is to be powered by a Curtiss-Wright-built Sapphire, and will be known as the RF-84F. This version is said to differ from the standard F-84F in that the nose intake has been replaced by a wing-root configuration, presumably to permit the installation of camera equipment in the nose.

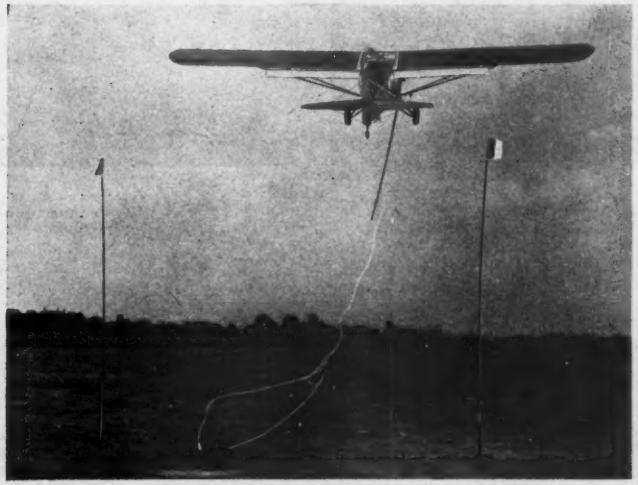
Soviet Secret Weapon?

RUSSIA'S women parachutists continue to make bigger and better delayed drops. The latest reported achievement is a jump from 23,295ft by Valentina Seliverstova, who did not operate her release until she had fallen 20,277ft, thus beating by 3,936ft the effort of Elena Vladimirskaya. Free falls of over 26,000ft have already been made in U.S.A.F. experiments with barometric automatic releases (see *Flight*, April 13th, 1951).

Glider's 550 Miles

AMERICA'S national gliding champion, Dick Johnson, is reported to have flown a sailplane 550 miles from Odessa, Texas, to Salina, Kansas. If the record is officially confirmed it will displace from the F.A.I. world-record list the straight-line-distance of 467 miles standing to the credit of a Russian woman pilot, Mlle. Klepikova, since July, 1939. On July 28th Johnson broke the American national distance record with a flight of 420 miles.

IT'S IN THE BAG: An Auster 7 recently delivered to the Burma Air Force is fitted with message-collecting equipment, here seen under test. The loop supported on the two uprights has been engaged by the hook, but has not yet lifted the bag.



FARNBOROUGH FACTS

WE are receiving numerous inquiries about public admission to the forthcoming S.B.A.C. Flying Display and Exhibition. For the guidance of intending visitors, the essential facts are: Public days, Saturday and Sunday, September 15th and 16th. Admission: Pedestrians 3s; children (under 16) 2s; cyclists 4s. Vehicles: Motor cycles 2s (riders at pedestrian rates); combinations and three-wheelers (with occupants), 10s; cars (with occupants), 20s; coaches (with occupants) £5; double-decker buses (with occupants), £10. Reserved enclosure 10s per person extra (children 5s). Advance bookings are handled by Auto Parks, Ltd., 1, Maclise Road, London, W.14. (Shepherd's Bush 5385.)

IN BRIEF

PAPERS by representatives of B.O.A.C. and K.L.M. are among those which will be read at the Design Congress to be held by the Council of Industrial Design at the Royal College of Art in London on September 19th and 20th.

* * *

Mr. H. K. Miller, who became personal assistant to Mr. William Sinclair, director of the Dunlop Rubber Co. (Scotland), Ltd., upon the formation of the Scottish company in 1946, has been appointed its sales secretary.

* * *

A large plant has been established by the Dewey and Almy Chemical Co., Cambridge, Mass., for the manufacture of "Fibrak" battery separators under licence from Oldham and Sons, Ltd., the Denton, Manchester, battery manufacturers.

* * *

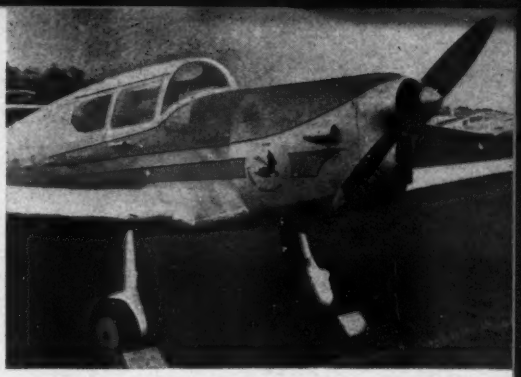
In four colours and four languages—English, French, Spanish and German—a handsome new brochure illustrates the production and typical uses of the "Hydra" steels and tools made by Hall and Pickles, Ltd., Sheffield.

* * *

Peto and Radford, Ltd., manufacturers of "Dagenite" aircraft batteries, state that they are among the first aircraft-accessory manufacturers to be accepted under the Ministry of Supply's new design-approval scheme for aircraft instrument and electrical equipment.

* * *

An admirable new series of 10 coloured wall-charts (31in. by 23in.), illustrating and explaining oil production from initial survey to final distribution, is available at 11s 6d (including postage) from Shell-Mex and B.P., Ltd., at Shell-Mex House, Strand, London, W.C.2.



(Left) Capt. J. H. Christie, of D.N.L., checks over the Hirth engine of his Klemm Kl 35D monoplane, of pre-war German design. (Right) Fillingham's Moth Minor Coupé was seen to be fitted with oleo-leg fairings and three-quarter-spats.

SEEN AT SHOREHAM

AMONG the 44 aircraft which, with their hopeful pilots, lined up for the start of August Bank Holiday's rained-out *Daily Express* Race at Shoreham, were several which had not previously appeared in competitive events in this country. Of special interest to the novelty-hunter was the attractive specimen entered by Hugh Kendall, chief test pilot to Handley Page (Reading), Ltd.—the diminutive Chilton D.W.1, powered by a 32 h.p. Carden Ford engine It had also been fitted with a tiny scimitar-like airscrew and was said to be capable of 117 m.p.h.—a particularly good speed for an ultra-light aircraft (it weighs less than 700 lb). In addition, it was sporting an ingenious little bubble canopy. In the ultra-lightweight category, also, there was Tony Cole's black and gold Comper Swift, fitted with a Pobjoy Niagara Mk I engine which is apparently giving 8 h.p. more than the previous Pobjoy R.

A little further up the weight scale one found the limit machine, R. E. Gillman's 1931 Avian, the oldest aircraft to be entered. Despite the fact that for some years it had stood clownishly on its nose in a corner of a hangar, exhibiting a frightening degree of dihedral on its mainplanes, its smart appearance on Monday spoke well of the high standard of workmanship shown by Gillman and the group of fellow-enthusiasts who helped to rebuild completely what was once nothing more than a misshapen wreck.

Also a newcomer to the racing scene in this country was the Hirth-powered Klemm Kl 35D, an attractive low-wing monoplane of pre-war German design. Its pilot was a D.N.L. skipper, Capt. J. H. Christie. A novel feature of this machine is the arrangement by which both sides of the main engine cowling open clam-fashion to give completely unimpeded access to the entire power unit.

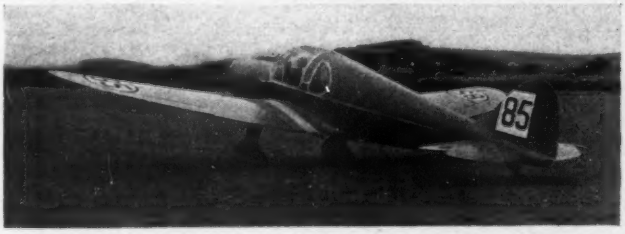
A much admired entry of considerable aesthetic appeal was the D.H Moth Minor Coupé flown by the de Havilland test pilot, Pat Fillingham. The only machine of its kind in existence, it was actually one of two pre-war prototype Moth Minors (the other was an open-cockpit machine). It is still fitted with the original 90-h.p. Gipsy Minor I engine.

The French Lignel 46 four-seater monoplane also caught our eye. Despite its plainly functional design and sturdy construction it has a surprising turn of speed, having attained an average of 163 m.p.h. in last year's *Daily Express* Race. The power unit is a 185-h.p. Mathis 8.G.20 inverted vee-eight.

Probably the most striking members of the foreign contingent, however, were the two Ambrosini S.7s from Italy. Although appearing externally identical, they are, in fact, fitted with different engines, Count Bonzi's being powered by a Gipsy Queen 30 while G. A. Ferrari's has an Alfa 115. The S.7 is a beautifully proportioned trainer and looks almost "tailor-made" for racing purposes.

Altogether, last Monday's event produced as colourful and interesting a collection of aircraft as has lately been seen in this country. It is to be hoped that all of them will line up once again on September 22nd, when the *Daily Express* has sportingly agreed to re-stage the race.

The slightly cranked wing-form of the Lignel 46 (No. 85) shows up in this rear view as it taxis to the starting line. Immediately below it is one of the Ambrosini S.7s, whose pleasing lines lend conviction to its reputed capabilities as a high-speed machine. A neat modification (right) was this bubble-type canopy seen on Kendall's Chilton D.W.1. (Bottom, right) J. G. Garnier was the pilot of the French Norécrin 1203 (135 h.p. Régnier 4LO.)



THIS IS UTILIZATION

Facts and Figures from Australia: Some Comments on the Remarkable Records of the Internal Operators

IT is unquestionable that, even making due allowances for the more stable weather conditions and generally more suitable stage-lengths, the utilization figures obtained on Australia's internal airline systems approach the phenomenal. When it is learned—quoting just one example at random—that three of Trans-Australia Airlines' Douglas DC-4s between them averaged well over 4,000 hr each during the year preceding May, 1951, one can be forgiven for wondering what they have that we haven't.

And, of course, the answer is that they have little which couldn't be ours if we willed it to be so. Given the right stage-distances, the quick turn-round times, the traffic and a well-organized maintenance system, our own airlines could probably do nearly as well. From time to time, indeed, one or two of our charter companies, and the teams on certain Corporation routes, have shown fairly good annual figures by any standards.

Before going on to look more closely at the Australian picture—and to help to assure doubters that the utilization figure given for T.A.A. is no flash in the proverbial pan—let us set down a few gross, recorded and probably unpalatable facts and figures which have reached us from a British aircraft technician who has just returned from Australia.

Contrary to anything one might superficially expect, the big hourage figures on Australian airlines are not logged, nowadays, by the faithful DC-3s or Dakotas—they are put in on the DC-4s. And for one very good reason: The Skymasters fly day by day the long stage-lengths that are obviously required for the average of something like 11 hr which they record daily throughout the year. The runs between points such as Adelaide and Perth (1,415 miles) and Brisbane and Darwin (1,780 miles) make up this total, which does not, as in the case of the DC-3s, become largely non-productive by reason of inevitable turn-round delays.

Of course, the older DC-3s still carry the prizes for monumental total hourages. For instance, a particular Dakota (-ABR), owned by Australian National Airways, had, by the middle of this year, flown 37,149 hr since it was purchased, new, in November, 1938. That is by no means an all-time record; another DC-3 owned by the same company had, before it was lost in an accident, flown something like 45,000 hr. Whether anything much more remained than the registration plates of the original airframe and engines is another matter.

But the interesting thing is that it is not necessarily the tried old-timers which put in good hourage figures. Allowing for the longer turn-round wastages with the shorter-stage aircraft, Trans-Australia Airlines' Convairliners have put in some remarkably good figures since they were delivered in and around 1948. Between April, 1950, and April, 1951, three of the fleet of these CV-240s averaged 2,870 hr per aircraft—the best figure just comfortably topping the 3,000 mark. Even during the six months of initial service the first four Convairliners each averaged more than seven hours a day. In fact, five aircraft, between them, averaged 2,573 hr each in their first year's service.

Such utilization figures are possible, even in the best service conditions, only when an airline has a really excellent maintenance organization and when the power-plants of its aircraft live up to their recommended inter-overhaul times in actual practice.

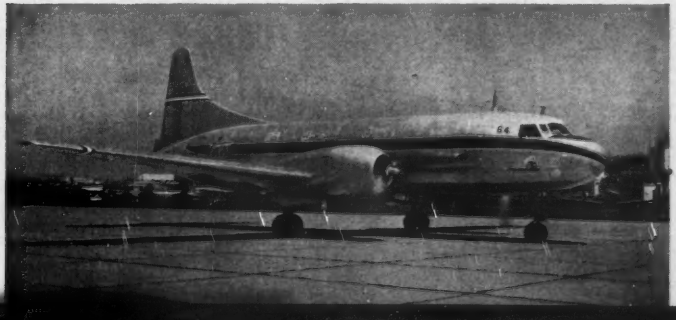
The work in the shops, it seems, is planned entirely to the needs of the timetables, and the target man-hour figures for various types of overhaul are almost fanatically maintained or reduced. As a matter of interest, T.A.A.'s target estimates for daily inspections are four man-hours for a DC-3, nine-and-a-quarter for a DC-4 and eight-and-three-quarters for a Convairliner—excluding, of course, towing and hangar movement times.

The inter-overhaul period scheduled for a modern engine—the R-2800-CA-15 in the DC-6—is (or was until recently) 1,000 hr. Between January and June, 1950, T.A.A. (for British Commonwealth Pacific Airlines) carried out six unscheduled or precautionary changes during a total engine flying hourage of 21,588—or 3,598 hr per unscheduled change. This was probably better than the usual average for the type of power unit but it serves to show how high utilization figures may be maintained; there is nothing more wasteful of possible grand totals than unscheduled engine changes at inconvenient times and places. In the changes made in the case of the CA-15s the few failures were in various normal categories, with impeller and reduction gears heading the very short list.

The newer-type Convairliner power plant—the R-2800-CA-18, which has an inter-overhaul period of 900 hr—suffered rather more teething troubles in the same period, though its record was good by any standards. Excluding changes which were made following damage caused by the failure of a nosewheel leg on one of these CV-240s, there were 11 unscheduled or precautionary changes in 12,828 engine-hours—an average of 1,166 hr between each. Exhaust valves and pistons headed the short list of causes.

Such records are not, in their direct form, particularly valuable as a means of checking the objectivity of the official inter-overhaul periods. For this, knowledge would be required of the hourage at which each failure occurred and the information then balanced against the condition of the engines after their strip at the set time. But the results certainly suggest that engine reliability plays a considerable part in the extraordinarily high utilization figures obtained on the Australian airlines.

Here, again, there is no reason to suppose that British engines would not put up an equally good performance. It would be interesting to see comparable figures for, say, the Bristol Hercules, which has settled down well in service and, like the CA-15, has an official inter-overhaul period of 1,000 hr plus. After six months or so of Centaurus operation in the B.E.A. Ambassadors we shall be able to guess whether this larger engine is heading for an equally attractive top figure, though, with relatively few engines of the type in service, it may be some little time before the A.R.B. has gained sufficient experience to be able to raise the "ante," by increments, to a similar figure. Increased utilization on the European routes will help, and this, in turn, will reduce



VH-TAO, one of the 240-5 Convairs belonging to Trans-Australia Airlines. A 40 seater, its all-up weight is 40,500 lb. with a maximum payload for normal passenger operation of 9,300 lb.

THIS IS UTILIZATION . . .

the time-lag between check strips—thus providing a closed spiral of progress.

Since mere utilization is valueless by itself as a money-making aim, it will be interesting to look at the passenger-load factors on which the service frequency might be usefully stepped up. The Australian figures quoted are for the first quarter of 1950 and are interesting if only as a means of once more emphasizing the popularity of air travel in that country.

Analysing some of the highlights, we find that A.N.A. filled 86 per cent of their seats on the Melbourne Sydney run. The present A.N.A. timetable offers eight to nine services a day in each direction on that route—against 12 summer services on B.E.A.'s Paris run. That 86 per cent factor is, as one might expect, one of the highest given in the records for the chosen period, but it is not quite the highest. Guinea Airways were reported to have filled 90 per cent of their seats on the Adelaide-Kingscote run, but this service is not recorded in timetables and may therefore be assumed to have been a "special."

The next best figure given in the table is for Butler Air Transport, with 84 per cent between Sydney and Nabiac—a semi-local run, where the results confirm the way in which air travel is used in preference to the sometimes slow and uncomfortable means of alternative surface transport. Guinea Airways, incidentally, gallop home with the highest average factor throughout their Adelaide-area network, with a figure of 73 per cent.

Of equal incidental interest is the fact that Guinea Airways no longer operate to or in New Guinea, where Qantas Empire Airways now hold sway—though G.A., otherwise occupied, have retained the name which was made in the days of the air gold-rush of the 'thirties, when mining equipment was carried piecemeal (and in very hefty pieces) between the coast and the mines in Junkers 52s on which tin-opening structural alterations had been carried out.

When it is recorded that the total average passenger-load factor for all the internal services in Australia was as high as 66.8 per cent in 1950—and may even be higher now—we begin to see why maximum utilization is both possible and important. The airlines there, we are told, actually make money, which (remembering our good friend Doctor Samuel Johnson, who, with the evidence then at his disposal, and in all solemnity, said that we should die of suffocation if exposed to stage-coach speeds in excess of 20 m.p.h.) just isn't possible.

T.A.A. Convairliner Operations on Introduction into Service

	Total hours in first year
VH-TAO	2,658
VH-TAP	2,732
VH-TAQ	2,312
VH-TAR	2,600
VH-TAS	2,565

First Four Convairliners Delivered: Average Daily Flying Times During Six Months' Initial Operation

Reg.	January 1949	February 1949	March 1949	April 1949	May 1949	June 1949
	hr min	hr min	hr min	hr min	hr min	hr min
VH-TAP	5 43	6 7	7 6	9 8	6 17	8 9
VH-TAQ	5 53	5 34	7 22	7 47	8 25	7 58
VH-TAR	6 30	5 37	7 44	9 16	8 42	7 38
VH-TAS	6 10	6 22	6 58	7 36	7 56	8 46
Number of days off service:						
VH-TAP	1*	4	2	1	8*	1
VH-TAQ	6	3	2	5	1	0
VH-TAR	1	3	1	1	0	2
VH-TAS	4	2	3	5	1	1

Total Hours for First Six Months:	hr min	Inclusive average per day hr min
VH-TAP	1,145 15	7 18
VH-TAQ	1,300 10	7 11
VH-TAR	1,375 40	7 36
VH-TAS	1,322 55	7 18

* VH-TAP went into service on January 24, 1949, and these missing days are not of course, included in the off-service totals or the daily average for that month. In May VH-TAP was withdrawn for repairs, following an undercarriage mishap.

R.Ae.C. AVIATORS' CERTIFICATES

BELOW is another of the periodical lists of those who have qualified for Royal Aero Club Aviators' Certificates, covering the period from June 25th, 1951, to July 26th, 1951. The previous list (May 10th to June 25th) appeared in *Flight* of July 13th.

No.	Name	Club or School	Date
27,300	Raymond Thomas Whitfield ...	Qualified Service pilot	25.6.51
27,301	James Anthony Vigar	Qualified Service pilot	25.6.51
27,302	Ian Richmond	Qualified Service pilot	25.6.51
27,303	Amos Michael John Merry ...	Qualified Service pilot	25.6.51
27,304	Alan Ernest Creeth	Qualified Service pilot	25.6.51
27,305	Dennis Coop	Qualified Service pilot	25.6.51
27,306	Albert Edward Nivon	Airways Aero Club	26.6.51
27,307	Stephen Mitchell Thomas ...	Liverpool Flying Club	28.6.51
27,308	Guy Sydney Hatch	Liverpool Flying Club	28.6.51
27,309	William Jeffrey Roberts... ...	Liverpool Flying Club	28.6.51
27,310	Brian Erbery Grimshaw... ...	Liverpool Flying Club	28.6.51
27,311	Kenneth Albert Oriel Munson...	Qualified Service pilot	28.6.51
27,312	Wallace Ivon Warmington ...	Qualified Service pilot	28.6.51
27,313	Graeme Bruce Young	Strathtay Aero Club	28.6.51
27,314	Ronald Hugh McLauchlan ...	Qualified Service pilot	3.7.51
27,315	Cedric William George Hughes	Wolverhampton A. C.	3.7.51
27,316	Stephen William Botterill ...	Strathtay Aero Club	3.7.51
27,317	Alastair John MacDonald ...	Royal Naval Flying Club	3.7.51
27,318	Derrick John Woods	Herts and Essex A.C.	3.7.51
27,319	Oliver Quentin Hyder	Cambridge Aero Club	3.7.51
27,320	Douglas Thompson Adamson ...	Qualified Service pilot	3.7.51
27,321	Peter Sidney Bridger	Qualified Service pilot	3.7.51
27,322	Frank Percy Mann	Qualified Service pilot	3.7.51
27,323	George Cowper	Qualified Service pilot	3.7.51
27,324	Terence Henry Pollans	Herts and Essex A.C.	9.7.51
27,325	Michael Robert Southgate ...	Herts and Essex A.C.	9.7.51
27,326	Brian Edwin King	Cardiff Aero Club	9.7.51
27,327	Dennis John Vann	Wolverhampton A.C.	9.7.51
27,328	George Lewis Huntley	Qualified Service pilot	9.7.51
27,329	George Frederick Harvey ...	Qualified Service pilot	9.7.51
27,330	Edmond Augustus Devillez ...	Qualified Service pilot	9.7.51
27,331	John Richardson	Qualified Service pilot	9.7.51
27,332	Alan Edwin Colman	Qualified Service pilot	9.7.51
27,333	Peter Moffat Slade	Wolverhampton A.C.	9.7.51
27,334	Antonio Pastor	Elstree and Luton F.C.	12.7.51
27,335	Anthony Colin Bruce Chapman	London Aeroplane Club	12.7.51
27,336	Ian McPherson Fenton	R.A.F., Cottesmore	12.7.51
27,337	Ellis Wyn Williams	R.A.F., Hooton Park	12.7.51
27,338	Donovan Herbert Clarke ...	Wiltshire School of Flying, Ltd.	12.7.51
27,339	John Michael Hughes	Herts and Essex A.C.	12.7.51
27,340	Gwilym Lloyd Williams ...	R.N. Flying Club	12.7.51
27,341	Richard Trenary	Airways Aero Club	12.7.51
27,342	John Wyckham Scofield Suckling	Qualified Service pilot	12.7.51
27,343	Charles Hannah Walker... ...	Strathtay Aero Club	13.7.51
27,344	John Mark Mitchell	Redhill Flying Club	16.7.51
27,345	John Trevlyn Holmes	Midland Aero Club	16.7.51
27,346	George Nathan Drinkwater ...	Redhill Flying Club	16.7.51
27,347	Arthur Clive Charlesworth ...	Redhill Flying Club	16.7.51
27,348	Kenneth Francis Peacock ...	Redhill Flying Club	16.7.51
27,349	Alan Bernard O'Hagan	Rochester Flying Club	19.7.51
27,350	Harold Percival Dixon	Strathtay Aero Club	19.7.51
27,351	Luis George Anthony Maria Gordon	Redhill Flying Club	19.7.51
27,352	John Malcolm Copeland... ...	Redhill Flying Club	19.7.51
27,353	Edward Statters	Qualified Service pilot	19.7.51
27,354	Alan Raymond Taylor	Qualified Service pilot	19.7.51
27,355	Robert Geoffrey Halstead ...	Qualified Service pilot	19.7.51
27,356	Arthur Christopher Doggett ...	R.A.F., Cranwell	19.7.51
27,357	Desmond Arthur Vaughan Clark	R.A.F., Cranwell	19.7.51
27,358	David Mangnall Howorth ...	Qualified Service pilot	19.7.51
27,359	Trevor George Prytherch ...	Central Flying Group	19.7.51
27,360	Neville Nathan Wolfe Bradpiece	Lancashire Aero Club	19.7.51
27,361	Somphong Butranon	Qualified Service pilot	19.7.51
27,362	Brian Stephen Walley	Qualified Service pilot	19.7.51
27,363	John Akers	Qualified Service pilot	19.7.51
27,364	Geoffrey Raymond Willson ...	Qualified Service pilot	19.7.51
27,365	George Kingsley Edward Martin	Qualified Service pilot	19.7.51
27,366	Kennath John Michael Davis ...	R.A.F., Cranwell	19.7.51
27,367	Edward Hugh Legget	R.A.F., Cranwell	19.7.51
27,368	Frederick Ronald Lund	R.A.F., Cranwell	19.7.51
27,369	Nihal Evelyn Weerasinghe ...	R.A.F., Cranwell	19.7.51
27,370	David Allen Wickins	Fair Oaks Aero Club	20.7.51
27,371	Jack Perkins Hey	Airways Aero Club	23.7.51
27,372	Alan Glanville Tippar	Herts and Essex A.C.	24.7.51
27,373	Richard Henry Tretheway ...	Plymouth and Dist. A.C.	24.7.51
27,374	Patrick Dale Wood	U.L.A.A. Experimental Group	24.7.51
27,375	Samuel Morris	Redhill Flying Club	24.7.51
27,376	Bryan Leonard Earl Irvine ...	London Aeroplane Club	24.7.51
27,377	Colin Douglas Stewart	Strathtay Aero Club	24.7.51
27,378	John Derek Euman Renshaw ...	R.A.F., Cranwell	24.7.51
27,379	James Stewart Readdie Salmond	R.A.F., Cranwell	24.7.51
27,380	Kenneth Levi Hirst	Qualified Service pilot	24.7.51
27,381	Matthew Young	R.A.F., Cranwell	24.7.51
27,382	Ivor Arthur Simmons	R.A.F., Cranwell	24.7.51
27,383	Alan John Selwood	R.A.F., Cranwell	24.7.51
27,384	James Hadley	Qualified Service pilot	24.7.51
27,385	Francis Lincoln Walford ...	Qualified Service pilot	24.7.51
27,386	Stanley Leslie Aitken	Liverpool Flying Club	24.7.51
27,387	Edwin Wild	Coventry Aero Club	26.7.51
27,388	Geoffrey Arthur Henry Coleridge	Coventry Aero Club	26.7.51
27,389	Robert John Williams	Luton Flying Club	26.7.51
27,390	Francis Edward Cloud	Plymouth and Dist. A.C.	26.7.51
27,391	Ernest John Smith	Herts and Essex A.C.	26.7.51
27,392	John James Lawrence	Darlington and Dist. A.C.	26.7.51
27,393	John Anthony Hawkey	Qualified Service pilot	26.7.51
27,394	Henry Howard Bernard Capes...	Doncaster U.L.A.A. Gp.	26.7.51
27,395	Albert Allan Carress	Qualified Service pilot	26.7.51

The Vickers "Viscount" is powered by four Rolls-Royce "Dart" propeller-turbine engines

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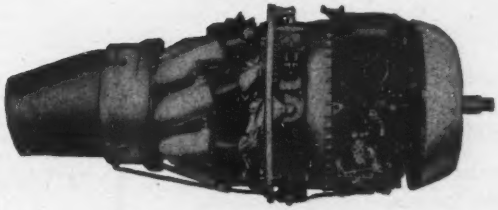

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MORE ABOUT THE D. H. HERON

Considerations which Led to Its Unusual Features: Advantages of Simplicity

FOURTEEN months from the date of its first flight the de Havilland Heron feederliner has been granted an unrestricted C. of A. The manufacturers point out that a measure of the growing complexity of today's airworthiness requirements is the fact that, apart from early development tests, 180 flying hours over a period of eight months have been occupied with performance measurement and handling trials for the C. of A. For comparison, the D.H.86 four-engined airliner of 1934 was built, tested and certified all within a period of four months. The Heron may be regarded as a direct descendant of the D.H.86.

In a recent issue of *Flight* (August 3rd) some impressions of a day's outing in the Heron were given, together with some notes on the aircraft's particular features and capabilities. As an indication of some of the considerations which have led the de Havilland company to produce and develop the Heron, and now to put it into small-scale production, we may quote a paragraph forming part of the introduction to an official description :—

> How far the increasing severity of the International Airworthiness Standards demanded of today's civil aircraft can be held responsible for the parallel growth in the complexity of the aircraft itself may be open to argument : but it is beyond dispute that the modern airliner with its many ingenious devices, each helping to maintain the aircraft's overall commercial efficiency, while still complying with International Standards, imposes on the operator the need for elaborate maintenance facilities and a degree of engineering skill which only the major airlines can hope to achieve. There is indeed some justification for the fear that, if present trends continue, the small increases in performance obtained by over complication, will, in the end, lead to a disproportionate rise in maintenance cost, a higher rate of unserviceability and even, perhaps, in a lowering of safety standards.
>
> In designing the Heron to meet the need for a medium-sized feederliner to serve the subsidiary air routes and to operate from the smaller airfields, often situated in the more remote regions of the world, a determined effort has been made to produce a rugged practical aircraft combining a high degree of economic efficiency with a structure of unusual simplicity needing only a moderate standard of maintenance, both in cost and engineering skill, such as might be appropriate to the small airline operator.

Thoughts such as these, put into practice, account for the Heron's fixed undercarriage, non-feathering airscrews and mechanically linked constant-speed and throttle controls. Some additional notes on these features follow.

To refer to the airscrews first, it has been calculated that in the case of the Heron the extra weight of four feathering airscrews would amount to the equivalent of one passenger, and, moreover, in such matters as cost and maintenance as well as weight, the familiar and well-tried 1,000-size bracket-type constant-speed airscrew offered obvious advantages. Many thousands of these airscrews have been manufactured since the original one was produced in 1935. It was not, of course, overlooked that there would be a performance loss in the event of engine failure if airscrews could not be feathered, but calculations indicated that the Heron would have an adequate margin of power to meet three-engine-flight requirements. This has subsequently been borne out on test. Some figures were given in our description referred to above for three-engine climb and safety speed. The latter has been fixed at 87 m.p.h. in order to comply with normal airline procedure for take-off, but, in fact, at the all-up weight of 12,500 lb the Heron has been flown off from a standing start on a number of occasions with only three engines running. This was in the course of flight trials, and the aircraft was airborne from the runway in each case in under 1,000 yd.

The inability to bring a damaged engine to rest was given careful consideration because of the risk of further serious damage following the initial failure and the possibility of fire. However, examination of the records of over one-and-a-half-million flying hours accumulated with four of the best-known types of aircraft powered with Gipsy Six or Gipsy Queen 30 engines reveals that there has not been a single case of fire in the air, nor are there any reports of serious consequences—break-up, fall from mountings, or airframe damage—resulting from the windmilling of an engine.

In the case of the Heron, which is fitted with four Gipsy Queen 30 engines, provision has been made for turning-off the supply of oil, as well as petrol, to individual engines, and thus no inflammable liquid would be fed to the engine. The act of stopping the oil supply to a windmilling engine may be regarded as a fairly drastic last resort which would quickly result in its stiffening up to an extent sufficient to stop rotation with airscrew in coarse pitch.

Assuming some representative operating figures for the purpose of calculation—300 miles stage length; 1,500 hr annual utilization; 75 per cent average load factor; 6*s* per ton-mile revenue—the extra weight which would be entailed if feathering airscrews were fitted might result in a direct loss of revenue of £2,000 per year.

Because the question is still considered to be controversial by some operators, the Heron is offered for sale with either fixed or retractable undercarriage. It is designed primarily for short-haul services and the difference in time and cost on, for example, a stage-length of 200 miles, resulting from the provision of a fixed low-drag undercarriage as opposed to the retractable type, is small. If the retractable type of undercarriage were fitted, there would be a penalty of 100 lb of payload for a stage-time saving, in these circumstances, of only four and a half minutes.

Dove pilots will be interested to learn that the Heron with fixed undercarriage and with flaps at 20 degrees has a flatter gliding angle than the Dove with undercarriage lowered but with flaps up.

A brief description of the mechanical linkage of the controls for constant-speed unit and throttle has already been given. Because a single lever now controls both the power and the airscrew of each separate engine, it is possible to use for the Heron the standard Dove throttle box, which has provision for two throttle levers and two airscrew control levers.

Although it might be supposed that a mechanical link-up system would lack flexibility, and perhaps result in reduced cruising efficiency, this is not in fact the case, and the de Havilland company states that the system was only accepted after careful investigation had shown that in all conditions of operation greater fuel economy could not be achieved with separate airscrew controls.

Typical flight conditions—take-off, climb and cruise—may be examined to illustrate the lever movement and the effect on throttle butterfly and c.s.u. In the fully forward position for take-off, the throttle butterfly is fully open and just under zero boost is obtained at sea level. The constant-speed unit at this setting gives the maximum 2,500 r.p.m. Commencing the climb after take-off, the levers are moved back to climb position as indicated by a reduction to 2,200 r.p.m. At this setting the butterfly is still fully opened, and therefore there is no reduction in boost. This state of affairs is maintained until the boost falls off as a result of increasing altitude. At about 3,000ft the boost figure will have fallen to —2 lb, at which point a weak-mixture setting is automatically brought in.

For level flight at cruising altitude, which will normally be between 5,000 and 10,000ft for the Heron, the levers are moved back until an engine speed of 2,000 r.p.m. is indicated, and this is roughly the half-way position on the quadrant. In this region a movement of the control lever has a considerable effect upon r.p.m., but causes only a very small change in boost. The throttle butterfly is slightly closed. The pilot is thus able to select a relatively wide range of settings for cruising r.p.m. and boost. At the lower end of the r.p.m. range the movement of the butterfly becomes relatively more marked following the movement of the lever more closely. This is in the region of 1,800 r.p.m. and less.

With the lever in fully-closed position, the butterfly is set for slow running and the airscrew will be in fine pitch and endeavouring to maintain speed although the constant-speed unit will be set for minimum r.p.m. Thus the settings are correct in the event of an overshoot. The fully-closed position is not, however, appropriate in the case of an engine failure, and, therefore, provision is made for positive selection of coarse pitch. This is achieved by releasing a safety catch and moving the lever further back through a gate.

Reference has been made to a five weeks' trial period of operation by the Heron in the hands of B.E.A. On the first Saturday, Sunday and Tuesday it flew normal scheduled services on the Jersey-London and Guernsey routes, putting in some six hours' flying per day with full loads. No snags were encountered. The Heron is normally based at Jersey and is operated by a B.E.A. crew, with Capt. J. Jordan—who is flight captain of the Channel Islands Flight and, incidentally at 50, the oldest pilot in the Corporation—at the controls. In the early part of this week, with Mr. Peter Masefield on board, it was due to fly from Northolt on visits to Speke, Glasgow, Ringway, Elmdon and Ronaldsway, I.o.M. On the next two Saturdays it will fly on the Channel Island routes.

STAND-BY COMPASS

Details of the Ultra-Small E2A Instrument Made by Kelvin and Hughes

As well as showing the compass life-size, this photograph also illustrates the clarity of indication given.

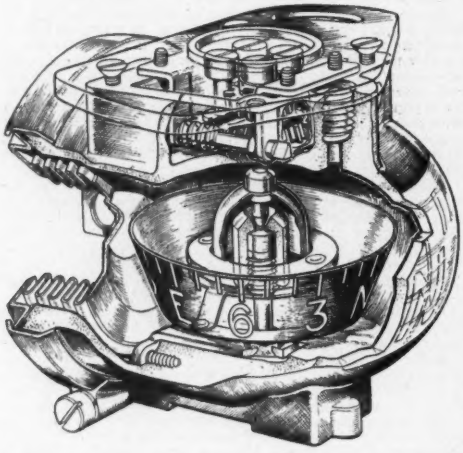
SINCE the introduction, during the war, of the distant reading compass, the development of remote-indicating compasses of various types has proceeded continuously, and today virtually all modern aircraft in service—other than light types—employ main compasses of remote-indicating pattern. Wisely, it has been made an official requirement that the main instrument, if it be one of these complex types, must be backed-up by a stand-by compass so that, in the event of failure in the main installation, the pilot has a second string available. It is usual for the stand-by instrument to be a bowl-type magnetic unit of orthodox pattern.

The new E2A compass, of which brief mention was made in the June 22nd and 29th issues of *Flight*, designed by the Admiralty Compass Observatory, and manufactured by Kelvin and Hughes, Ltd., is intended to fulfil the mandatory requirement for a stand-by whilst occupying the minimum of cockpit space. It could, in fact, scarcely be smaller, for it is but 2.25in wide, 2.06in high and 1.81in deep. It weighs 3 oz.

This very compactness underlines the fact that the new instrument is essentially of an emergency nature. The card is graduated in ten-degree divisions and, although accurate in north-seeking and well-damped in motion, is consequently too coarsely divided for precise reading. Indications can, however, be read with reasonable facility to within about two to three degrees. As such, the compass is therefore suitable for providing a reasonably close indication of heading, but is not suitable for use as a navigating instrument in the commonly understood implication of the term. This limitation is in no way derogatory : the instrument is entirely reliable, and although its basic *raison d'être* is to serve as an extremely compact stand-by, it is also, in fact, eminently well suited to installation in the cockpits of gliders and light aircraft, where it might well serve as the primary compass.

The main body of the E2A is a single-piece moulding of Diakon—a transparent plastic material—which is externally painted black, with the exception of a "bow-window" area of the bowl through which the card is visible—and, it may be stated, visible as rather larger than life, for the plastic bowl acts as a lens.

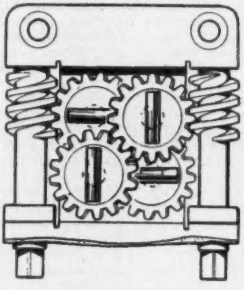
The card is an annulus of conical section, made in 15 per cent nickel silver, 0.003in thick. It is painted black and the divisions, letters and numerals clearly marked in luminous paint. Riveted to the base flange of the card is a spoked ring, which serves as a carrier for the magnet and pivot-dome assembly. The magnet is unusual in being annular, and is made of 35 per cent cobalt steel : in common with the pivot dome, it is riveted to the carrier.



Although the E2A compass is essentially a simple unit, its small scale makes necessary a particularly high standard of precision in manufacture.

The pivot assembly comprises a foundation bracket recessed in, and screwed to, the base of the compass body. The pivot-post stands vertically on this bracket, and is threaded for retention of the cup-holder which encloses and locates the sapphire bearing cup. In the crown of the dome is anchored the pivot needle which, of 25 per cent nickel silver, is tipped with osmium iridium.

The back wall of the compass is formed by a diaphragm of non-magnetic brass, carried on a corrugated bellows (also of brass) to form a sylphon, the whole being retained by a channel-section pinch-clip. The interior of the compass is completely filled with a silicone fluid, the viscosity of which provides sufficient damping of card motion for a steady reading to be obtained. The particular fluid used was selected because it makes no chemical attack on Diakon, and because the temperature viscosity changes are small : what changes of volume there are, however, are accommodated by the sylphon, and the compass will operate satisfactorily throughout a temperature range of from −40 deg to +70 deg C.



Plan diagram of compensating assembly, showing relation of the corrector magnets and spindles.

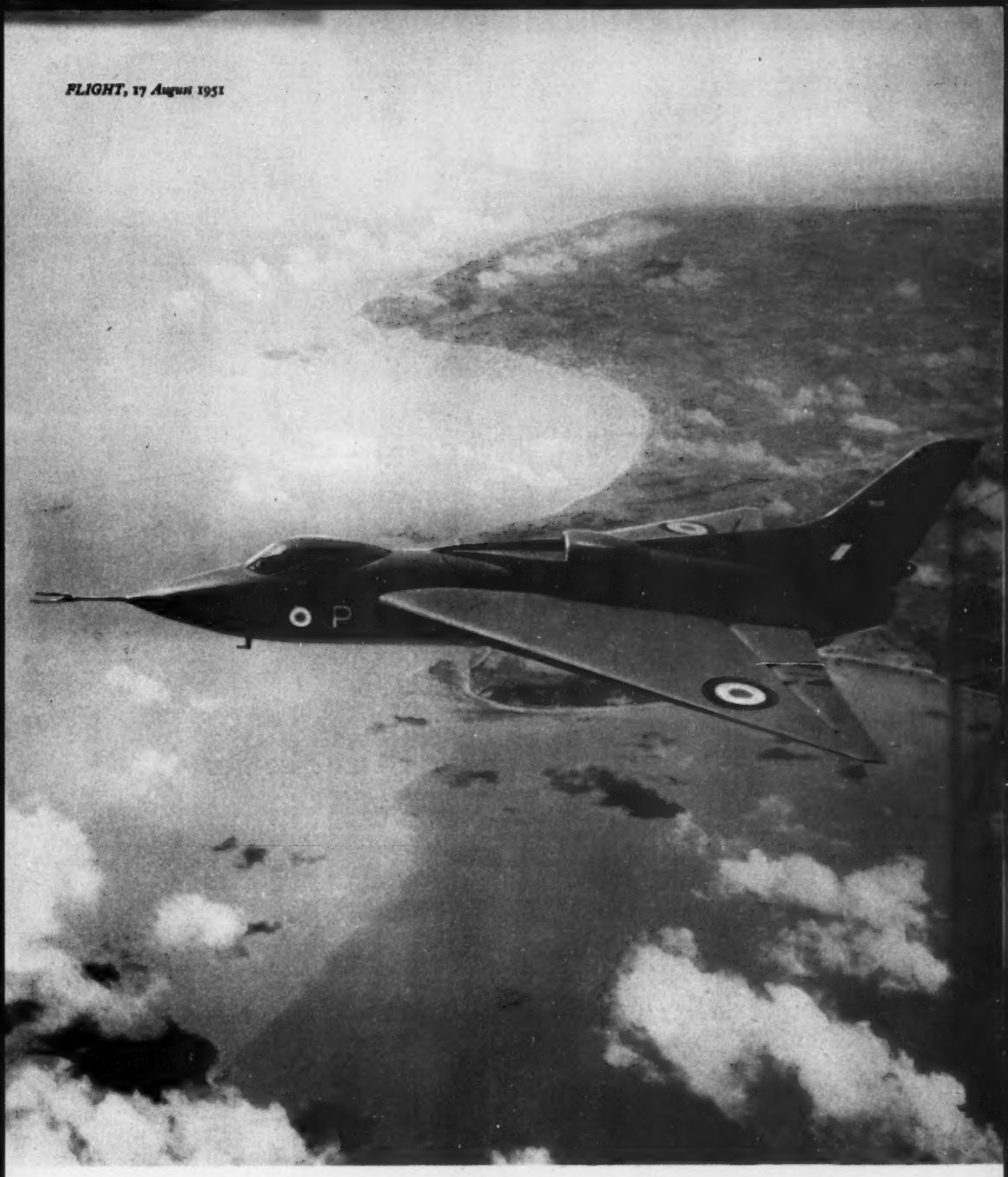
A recess formed in the head of the compass body serves to accommodate the compensating assembly, which comprises four vertical spindles, linked diagonally in pairs by skew gears, and carrying bar magnets housed in diametral drillings. Each pair of spindles is rotated by means of a worm, which engages one of the meshing skew gears, the worm-shaft being rotated by a special key, the socketed end of which mates with the triangulated end of the worm-shaft.

These pairs of compensating magnets are known as "B" and "C" correctors, and respectively provide north-south and east-west corrective forces. When the corrector magnets are in the neutral position, index lines engraved on the crowns of the spindles are aligned with continuation lines engraved in the top-plate of the compass. Naturally enough, there is also an "A" correction, but this is a final installation adjustment, and is catered for by circumferential slots in the top (mounting) plate, which allow for plus or minus ten degrees adjustment of the compass in azimuth.

NUCLEAR REACTORS

AUTHORITATIVE "atomic"n ews comes from Washington, where the Atomic Energy Commission has published its half-yearly report to Congress, in which it is stated that "substantial progress" has been made in the development of nuclear reactors to provide power for submarines and aircraft. Dr. Lawrence Hafstad, head of the A.E.C. reactor division, reports that one atomic submarine reactor is well under construction and that the design of a second type is far advanced.

The report also gives details of recent bomb tests at Eniwetok Atoll and states that work has not, in practice, been delayed by lingering radiation from high air bursts. Helicopters had been used to recover instruments and equipment.



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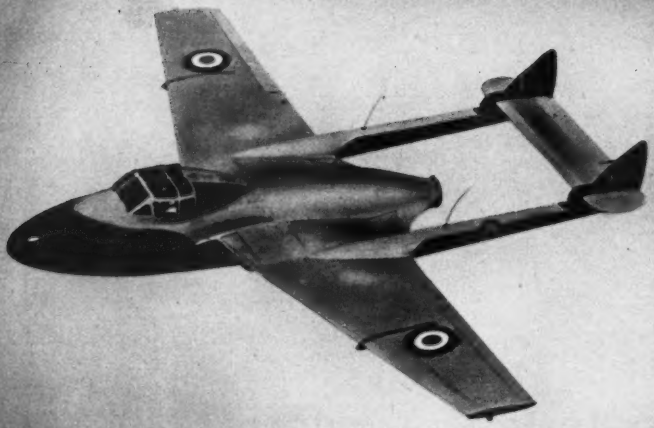

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SUPERMARINE SWIFT

ONCE again, and for the first time since 1939, the country has the comforting knowledge that there are flying and in production two successors to the famous Hawker Hurricane and Supermarine Spitfire, and that either of the new jet fighters could, without doubt, hold its own against all comers and better anything an enemy could put in the air. The announcement of the successful first flights at Boscombe Down of the Avon-powered Supermarine Swift F.1, following closely upon a similar one regarding the Hawker P.1067, has been received with the greatest satisfaction.

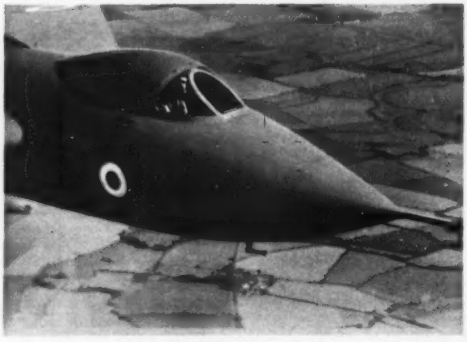
At the controls when these fine aerial photographs were secured was Lt. Cdr. "Mike" L. Lithgow, who has also been responsible for the testing and development of the post-war prototypes which have led up to the Swift. Although this Avon-powered prototype is completely new, it is very similar to the Supermarine 535 and thus flight-testing should proceed rapidly.

For reasons of security, neither performance nor armament may be discussed, but the Supermarine section of Vickers-Armstrongs, Ltd., confidently state that this powerful weapon will help to restore to Britain that supremacy in the air which she achieved and held during the war.

For spotters and others to whom such information is important, the Swift (a name hitherto unofficially associated with earlier prototypes) is registered WJ 960. The shape of the wing tips is distinctive.

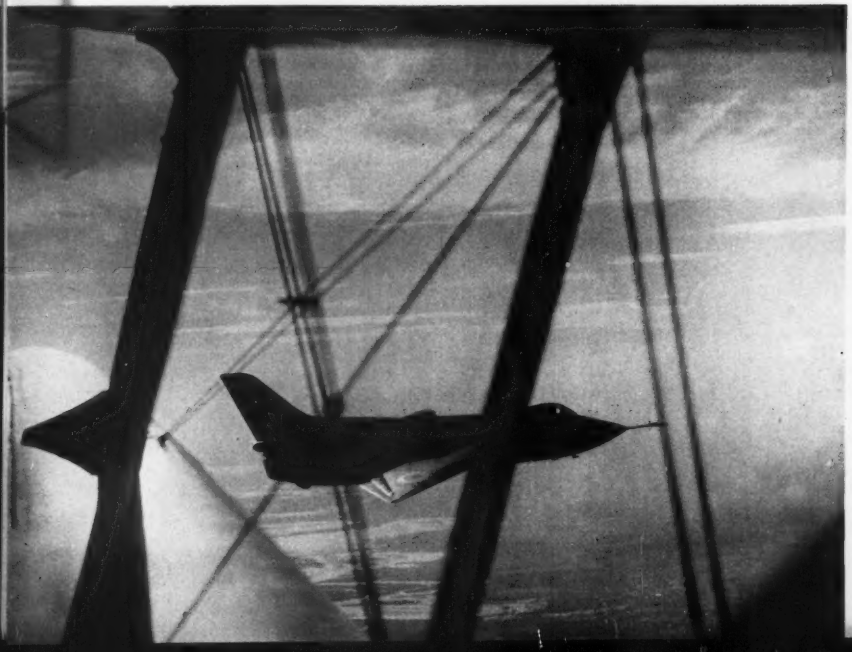
LAST week we were happy to be able to report upon the most promising progress which has been made with the Avro 707B and A, and here we add further pictorial evidence secured in all but one case (top right) by *Flight's* chief photographer. The aircraft depicted is, of course, the B, which is described as the low-speed research version. During the recent demonstration at Dunsfold in the hands of W/C. "Roly" Falk there were times when it appeared anything but slow. However, by comparison with the later 707A there are a number of design features which were adopted for utilitarian reasons rather than for high aerodynamic efficiency. The principal difference to be noted is, of course, the arrangement of the air intakes—a direct scoop on the fuselage top in the case of this, the 707B, but at the wing roots on the A.

The chief designer, Mr. S. D. Davies, and the chief aerodynamicist, Mr. J. R. Ewans, both ardent supporters of the delta layout, have assembled a formidable list of advantages offered by such a wing configuration, but they also make it clear that these are only to be felt to the full in large aircraft. The present aim with the 707 research aircraft is to prove the wing form and to gain all possible experience with control over a wide speed range and at altitude, in anticipation of bigger things to come.



DELTA'S

Pictorial Evidence of the Flying Qu



DAY OUT

ities of the Avro 707B at Dunsfold

By

FRANK ILLINGWORTH

Framed in ice: a bush-pilot's Norseman, ski-fitted, operates from the frozen fringe of the Arctic Sea, near the far-north settlement of Coppermine.

CANADA'S ARCTIC AIR SERVICES

Indispensable Work by Transport Aircraft among the Isolated Mining and Trapping Communities

CANADA is basing her industrial future on the vast mineral wealth of her Northlands, embracing an area twice the combined area of France, Germany, Poland and Italy, much of it unexplored "barrens." Were it not for the air freighter the wealth of Canada's North would be beyond ready reach for a decade or more, says the author of this article, who recently returned from 12,000 miles of flying in transport aircraft over the area.

THE predominant sound in Canada's Northlands is the drone of freight aircraft. There is hardly one aspect of daily life in the 2,000,000 square miles of Northern Canada that does not rely on air transport.

In a previous article [June 15th] I described how an airlift is being employed in the 200-million-dollar scheme to develop the iron-ore fields in the interior of Labrador. Though probably the biggest airlift of its kind in the history of civil aviation, it is noteworthy only for its size, for air-freight fleets are being used in the better part of a dozen industrial and mining ventures in Northern Canada, the aircraft ranging from two Junkers of early post-war vintage to the DC-3s and DC-4s of Canadian Pacific Air Lines, Goose amphibians and Norsemen operated by the smaller airlines and by bush pilots, and the freighting fleets formed by mining companies operating in the Northlands—for example, that of Hollingers, engaged in the Labrador iron fields airlift, and the transports flying uranium ore from Port Radium to Edmonton.

Freight ranges from sticks of celery to ore, and from Indian squaws and their papooses to prospectors and their canoes; people in the sub-arctic gold mining town of Yellowknife send their laundry to Edmonton (600 miles) by air; and freight to Yellowknife has included a horse.

I flew into the Labrador ore fields sitting on a load of timber, and made the return journey lounging in a prospector's canoe—with its owner, Albert Jerome, who hails from Oxford. The canoe offered the only seating accommodation, our DC-4 having been stripped for freighting work. When the aircraft took off from Burnt Creek the canoe slithered from the forward end into the lavatory at the rear, and when we landed at Seven Islands it shot the length of the hold and almost into the cockpit.

As we put down, a C-19 Fairchild Packet (loaned by the United States Air Force to the mining interests operating in

Landing widely assorted supplies from a Norseman floatplane at Aklavik.

Live cargo—a horse, securely lashed to the floor of a Ju52 freighter.

BALLIOL T. 2.

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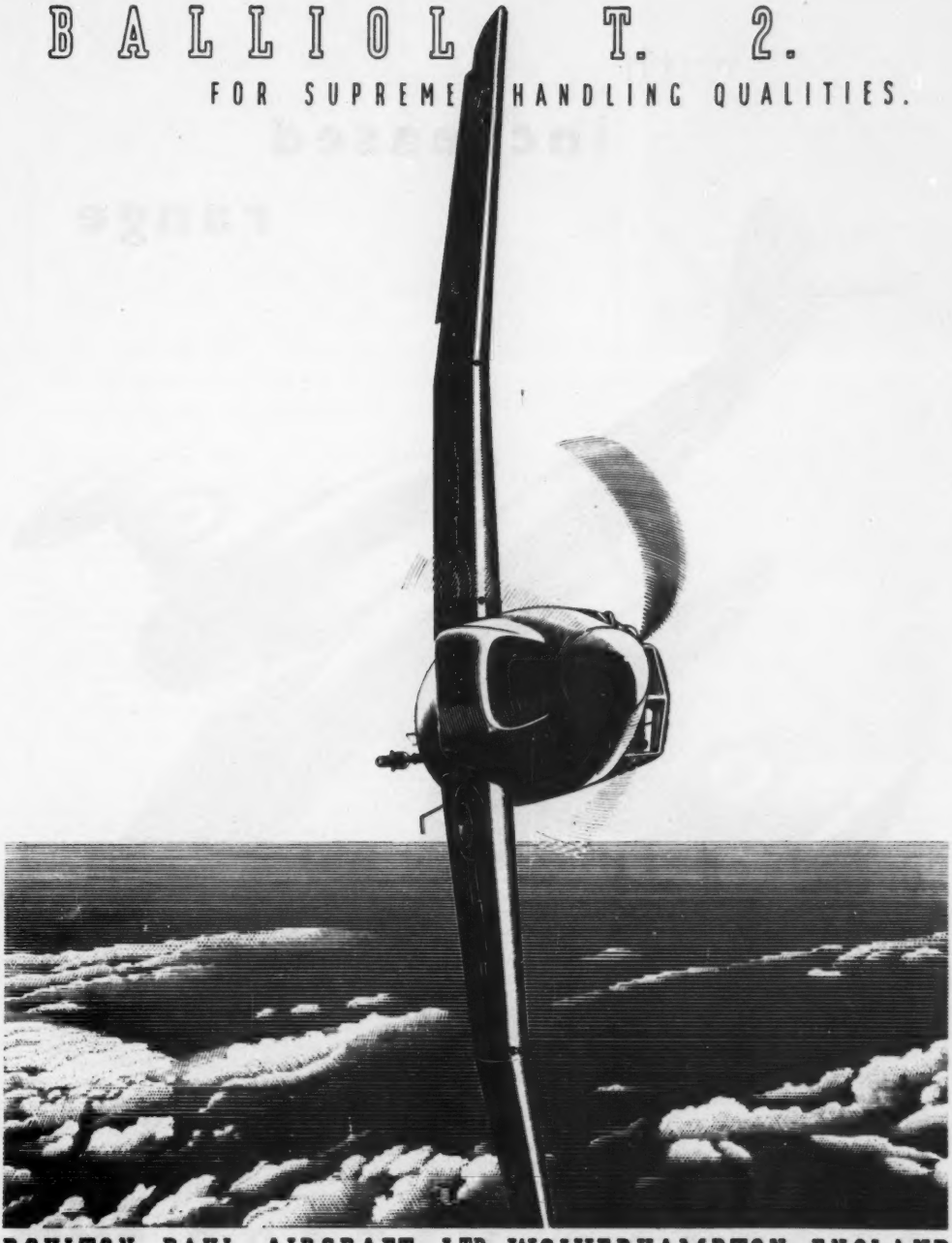

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The area of Northern Canada referred to by Frank Illingworth.

CANADA'S ARCTIC AIR SERVICES . . .

Labrador) was being loaded with a 40,000-lb scraper.

The passengers on the DC-4 in which I flew to Whitehorse from Dawson City (scene of the Klondyke gold rush of '98) included an Indian squaw, a doctor, a mining engineer and a road surveyor; there were also 200 lb of mail and two gold bricks. At Edmonton, gateway to the vast North-West Territories, I was told: "There's a special flight to the uranium mines at Eldorado today. They're short of meat and we're flying in 500 lb of beef. You can go in sitting on a 'side' of meat—and come back sitting on a 100 lb sack of uranium."

Canadian Pacific Airlines operates the main scheduled flights in Canada's Northlands; in fact, C.P.A. is to the Northlands what Trans-Canada is to the rest of the Dominion. Its schedules run with the precision of a railway timetable. Not once during my recent 12,000 miles of flying in the Northwest Territories and the Yukon were the DC-3s and DC-4s, in which I travelled, late on take-off or touchdown. Of course, it was summer; winter makes for uncertain flying conditions. Maintenance provides some difficulties when the temperature reaches the minus 30s and marked problems when the thermometer drops to the minus 70s (as it does almost every winter in the Yukon; in one recent year it fell to −83 F). Hangars must be heated and the engines of grounded aircraft protected with windshields. Condensation from the exhaust gives rise to a ground fog which can be quite marked when a number of aircraft are warming-up at the same time. However, it is seldom that scheduled flights are cancelled, even in winter, partly thanks to the extension of the chain of Loran and radio stations maintained by the Canadian Department for Transport and the R.C.A.F. Air services in Canada's "Eastern Arctic" (the Hudson Bay areas and northwards) have benefited from the airstrips built during the war at Fort Churchill, Southampton Island, Ungava Bay, and Frobisher Bay (Baffin Island), where Frobisher thought he had found the entrance to the North-West Passage. Strips have been built to the very shores of the Polar Ocean: that at Aklavik, in the "Western Arctic," can accommodate heavy aircraft; R.C.A.F. Lancasters have landed there.

Where it is not practicable to build airstrips, lakes and rivers serve as landing-places. Sunderlands, Sandringhams and Cansos have been used in Arctic Canada, but it is on the Norsemen that the more remote settlements rely. The Norseman is eminently suitable as a maid-of-all-work in the Northlands. Reliable, easy to handle, and the right size for the work involved, it is grounded only during "break up," when the waterways are littered with icefloes: immediately the ice "goes out" Norsemen put down on floats, and with the freeze-up their skis once more come into use.

Extension of air services in the Northlands is reflected in a steady reduction in freight charges. In the early 'forties freightage costs for the 600 miles from Edmonton to Yellowknife were 50c per kg. Transport charges for the consignment of meat which formed part of the cargo in the DC-3 that took me to Yellowknife were 30c per kg. The rail-and-water rate is 6c to 11c per kg, but the latter means of transport are slow, and restricted to the short summer. Many settlements must needs rely solely on air transport.

(Above) Three hot-air blowers supply an engine-warming tent for a Lancaster (Canadian Mk 10) of the R.C.A.F. Winterization Establishment. The lower picture shows Ernie Boffa, chief pilot of Yellowknife Airways, with his Stinson on the frozen lake at Yellowknife.

The bush pilot forms a link between the air terminals and outlying mining camps and trapper "stations." Flying a motley collection of Norsemen, Stinsons, Beavers, Cansos, Junkers, Bellancas and Moths, these pilots are prepared to fly anywhere at any time.

The free-lance pilot flies the prospector into unexplored country, keeps him supplied while he is "in the field" and flies him out again. He is prepared to take an injured missionary or a sick Eskimo to hospital. My arrival in Dawson City coincided with an air search for a prospector lost "in the bush." Reports to the Royal Canadian Mounted Police post at Dawson City prompted Corporal Sphor to solicit the aid of the local bush pilot, Jim Callison, and for the better part of a week he quartered the bush in a Stinson, flying low over the pines and bare rock of the Yukon. A day or two later a bush pilot arrived at Dawson City from the polar settlement of Aklavik on the shores of the Arctic Ocean with a sick Eskimo who, transferred to a C.P.A. Dakota,

(concluded at foot of next page)

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Flight Simulators

BY eliminating the "either-or" sequence of his query, Mr. F. H. Smith (Correspondence, July 27th) should arrive at an acceptable definition of a flight simulator. Thus :—

It is a teaching instrument in which both normal and emergency flight conditions are fed in at one end to pose problems for which *the trainee* has to find the correct answers in his handling technique. If he fails, he can be shown his faults and their cure, while still remaining in friendly and safe contact with the ground and using up no aircraft flying hours.

The flight simulator conception implicit in this correspondence has nothing to do with teaching the uninitiated to fly nor with improving a pilot's general capability and skill. Such ground training aids have received much attention from the days of the Sanders "teacher" of 1910—so interestingly resurrected by Mr. Norman Hill (August 3rd)—to the modern Link trainer.

The flight simulator proper concerns itself with one particular aircraft-engine combination, usually of the large and expensive variety. Its aim is to reduce to a minimum the process of flight familiarization with its attendant potential hazard and cost. By being able to confront the pilot or flight engineer with abnormal contingencies it can prepare him for the emergency he may otherwise only face on the one all-important occasion. Where large numbers of aircrew are involved during an expansion programme on new types there is a strong case for the parellel development of the appropriate ground-training equipment.

Derby. C. L. HININGS.

A Film Air Force

PERHAPS this letter will help clear up the mystery surrounding the Hurricanes based at R.A.F. Kenley for the film *Hawks in the Sun*, or *Angels One Five*.

Last of the Many, registered G-AMAU, originally bore the R.A.F. serial PZ 865, and was finished in light blue with a red spinner. It then appeared in its civil form, namely, gold and dark blue finish, minus all armament, and was to be seen flying up till and including the Hatfield Air Race day. On June 27th 'MAU was flown back to Langley and work commenced on faking it into a 1940-type Hurricane. Camouflage was applied, consisting of "light earth" and dark green on upper surfaces, and duck-egg blue on the lower surfaces. On the lower half of the outer leading edge yellow stripes were applied and the picture was completed by the painting on of R.A.F. roundels and the new serial number of P2619 (code letters, US-B).

Frank Murphy of Hawker's then flew P2619 down to Kenley where a number of sequences were taken, including the filming of a large number of spins. Whilst at Kenley the leading edges of the wings were covered with green dope, and also red patches of dope were applied, on which were painted black spots to represent the Hurricane's eight machine guns. P2619 differs from the other six Hurricanes flying in possessing a whip aerial, and six exhaust stubs on each side—the remainder are fitted with a rigid-type aerial and three larger exhaust stubs. *Last of the Many* was recently exhibited at Hendon in this condition.

LF 363 is the machine which leads the Battle of Britain fly-past, and was stationed at R.A.F. Waterbeach in August of last year. It first visited Langley in mid-June of this year and was in a steel-blue finish. An air vice-marshal's insignia was carried, and the remnants of cannon mountings were to be seen in its wings. These protuberances were removed and metal fairing plates installed; in this condition it was flown to Kenley.

On July 13th, whilst flying in a Tiger Moth from Redhill, I observed a camouflaged Hurricane overtake us at some speed and disappear into cloud. It must have been LF 363, but whether with a new serial I could not see—it certainly did not have fuselage code-letters.

The most interesting of the film debutantes are the five Hurricane 2Cs which have been lent by the Portuguese Air Force to the Air Ministry. On July the 17th or 18th, these Hurricanes, accompanied by an Anson (No. 215), landed at Langley. These were fitted with four 20 mm cannon, and long-range fuel tanks. Their colour scheme was a greeny-grey camouflage, with a "little gnome" insignia on the cowling. The guns and tanks were removed and the spinners blacked over. Their Portuguese serial and code letters were blotted out, and pseudo-R.A.F. serials and letters painted on in their place. The five "R.A.F." Hurricanes, resplendent in their new roundels, flew off from Langley on Friday, July 20th.

London, W.4. R. P. BATESON.

I NOTICE in the August 3rd issue of *Flight* that Mr. Ian H. Gordon suggests that the identification letters "US" were used by No. 600 Squadron.

This is not correct—these rather unfortunate letters were never used by 600, but were, I believe, allotted to No. 56—another good squadron.

London, E.C.3. J. F. M. WRIGHT.

J. E. Ellor—A Tribute

YOUR reference (July 27th) to the passing of the late Mr. James Ellor ("Jimmy" to most who knew him) reduces the number of old-time members who formed the original team of the engine research section of the then Royal Aircraft Factory (now R.A.E.) who were the early pioneers in the testing of engines.

He, together with others like Col. Hines, Mr. Bullock, Mr. Penn and Mr. Taylor, was doing good work 30 years ago. When Ellor left us in 1927 to take up his appointment with Rolls-Royce, Ltd., I for one knew he would make quick progress in the engineering world, because of his good knowledge and acquaintance with the superchargers—or blowers, as they were termed—of that era. The passing of time has proved his ability as an engineer by his rise to the high position he held at Rolls-Royce.

The passing away of these early and able workers in the aircraft industry has left gaps not easy to fill, and they will be missed, but not forgotten, by a colleague privileged to work with them.

R.A.E., Farnborough. GEO. L. MILLER.

CANADA'S ARCTIC AIR SERVICES (*Concluded from page 199*)

was flown to hospital in Vancouver, nearly 3,000 miles from his igloo.

When I enquired how I might fly from Yellowknife to Coppermine, another settlement on the edge of the Polar Ocean, I was told : "Ernie Boffa will fly you down there"—(in Canada you always fly *down* to the Arctic)—"he'll be taking off tomorrow on the monthly mail service."

A typical day in Ernie Boffa's logbook records the following flights : To Hottah Lake in a Bellanca; Fort Rae (to take a sick Indian woman to hospital); to Discovery Mine (with a doctor to inoculate the miners there), returning with a 72lb gold brick); to the Thompson-Lundmark mine with a tractor-crew.

Lone flying in the North requires a particular type of man. The bush pilot must be more than a first-class navigator. He must be a mechanic. He must have marked initiative, the mental stability necessary to survive hardship and hazard and sufficient foolhardiness to undertake ventures which more responsible men would avoid. He must always be prepared to take off under almost any conditions, for he and his aircraft serve as a link between outlying stations. The area he serves may be larger than that of the British Isles, as in the case of Russ Baker, of Fort St. James, British Columbia. Flying a venerable Junkers, Baker serves trappers and traders, Indian and white, delivering to them anything from boxes of dynamite to crates of food.

The bush pilot is prone to break a flight from A to B with a day's fishing on a lake that catches his eye. But he played a marked part in the 'tween-wars exploration of the Northlands; he paved the way for the regular air services of today; and he is still a pioneer.

Canada is basing her industrial future on the vast mineral wealth of her extensive Northlands, embracing an area twice the combined area of France, Germany, Poland and Italy, much of it unexplored "barrens." Were it not for the air freighter, the natural wealth of the Northlands would be beyond ready reach for many years to come, possibly for a decade or longer. As it is, I reached Arctic Canada from London in 40 hours' flying time, using the normal B.O.A.C., T.C.A. and C.P.A. services.

THE DESIGN-STUDY

Shortening the Tedious Preliminary Work in the Conception of a Modern Aircraft

By H. K. MILLICER, M.Sc., A.F.R.Ae.S.

IN the heroic era of aviation, the thin end of the scientific wedge had not been inserted into aircraft design, and the machines came into being largely by "eye," or to put it rather more euphuistically, through the artistic qualities of the makers. Those without artistic ability were forced to rely on "by guess and by God" methods.

Today, matters are different: no one with any knowledge or appreciation of the subject would deny that most of our great designers of aircraft are artists, but it would be foolish to claim that the artist is a better designer of aircraft than the engineer. The truth of the matter is that the finest aircraft are conceived by engineers who, willy-nilly, have a strong element of the artist in their make-up.

Artistry, however, is a tenuous quality which cannot easily be defined in finite or objective terms. Thus in this article the artistic element of aircraft design will be accorded recognition, but nothing more. It is with the rather more prosaic and definitive aspects of "engineering" the concept of an aircraft that we shall concern ourselves. The economic strictures of life today have virtually banished the private-venture design, and most aircraft come into being as a result of designers and their staffs carrying out a proper design-study to a given specification before starting the actual drawing of the machine. By "design-study" is inferred the setting-up of a design policy, which is followed logically by work of a semi-research nature which, in turn, leads eventually to the development of an aircraft shape.

A good design-study is based on the best theoretical and statistical data available, and freakish or doubtful singular evidence should be eschewed. After certain assumptions have been made, it becomes necessary for the designer to do his utmost to achieve them. For example, if the intention is to attain a percentage structure-weight of 25 for a military aircraft, it is necessary to strive extremely hard to get it, enforce strict weight-control in the drawing office, and impress upon the stressman in charge that it is chiefly his responsibility to keep the weight down on every component, no matter how small or insignificant. On the other hand, if it is intended that the aircraft shall have particularly low drag-characteristics, the shops must be instructed and supervised in the manufacture of wings and tail surfaces in which the design contours are maintained with high fidelity. This involves the special selection of light-alloy sheets of minimum waviness, machining rivets, rubbing down and filling and, too, the elimination of air leakage on all joints. In this last connection, it is of point to note that de Havillands ensure that all panel and structural joints on their aircraft are sealed, and by this means reductions of 15 to 20 per cent in profile drag can be achieved.

Every design-study should have as its aim the creation of the smallest and most compact aircraft for a given duty. An old designer used to tell the author, "there is no need to carry air inside your aircraft structure." Aircraft size is reducible as a function of the reduction of profile drag and, of course, by the application of high-lift devices, as they permit wing and tail areas to be reduced to minima. A generous use must, therefore, be made in the design-study of low-drag aerofoils and joint seals, and of high-lift flaps and slots. On the structural side of the design-study, long, slim sections, structural offsets and cut-outs should be avoided if possible. It sometimes occurs that a beautiful aerodynamic shape cannot be reproduced in practice owing to structural difficulties. Aircraft design is essentially an art of compromise, and it is manifestly impracticable to pursue an idea which, for example, involves a structural weight penalty which outweighs aerodynamic gain.

It is considered to be good design policy to make a generous allowance for large, high aspect-ratio control surfaces, together with control runs involving the minimum of friction. In addition, ample ratios between control-column and control-surface angular movement are worth while in order to decrease mechanically the pilot's stick forces. Many otherwise good aircraft have been spoilt at the outset by such things as having too short a tail arm, too great an amount of friction in aileron control, insufficient rudder area, too small a rudder pedal travel, and so forth.

Another thing to be decided at the start of a design-study is the type of undercarriage to be used. Tricycle undercarriages offer the greatest ease of taxying and landing and should, therefore, be used for all aircraft other than, perhaps, racing or research types, those aircraft designed to operate from very rough surfaces, and radial-engined trainers, a characteristic of which is that the wheelbase becomes dangerously short. It has been established that, if an aircraft is initially designed for a tricycle undercarriage, it need not suffer the weight penalty resulting from such a choice. (Ref. 1.)

For airscrew-driven aircraft, it is sound policy to provide for the largest diameter and largest solidity slow-turning airscrew that can be accommodated. In this connection, an especially designed airscrew, together with a well-chosen reduction gear ratio, can shorten the take-off run by half, can increase the initial rate of climb by 30 per cent, or can enable a high-drag aircraft to fly safely on one engine. It may not be generally realized that, for a given rate of climb on one engine, as much as 5 per cent of the payload in a twin-engined aircraft can be gained for every 1 per cent increase in airscrew efficiency.

The fact that such criteria as power-required curves, stability calculations and so forth, take so long to calculate and are, in any case, too cumbersome to use in preliminary work, frequently precludes the designer from being able to carry out a proper design study. So much time is taken up that he is often forced to something approaching pure guesswork, albeit the guesses are based on a knowledgeable foundation. In order to relieve this difficulty,

TABLE I: WEIGHT BREAKDOWN FOR AIRSPEED AMBASSADOR

Structure	Weight (lb)	Percentage a.u.w.
Mainplane, including centre-section	6,530	13.06
Fuselage, including floors	4,765	9.53
Tail unit	980	1.96
Landing gear	2,415	4.83
Nacelle structure and fairing (aft of bulkhead)	1,010	2.02
Flying controls	350	0.70
Total structure unit	16,050	32.10
Power Installation		
Engines, dry	6,370	12.74
Mountings, cowling	540	1.08
Engine cooling system	330	0.66
Oil cooling system	270	0.54
Oil in engines, coolers and airscrews	110	0.22
Engine accessories, exhausts, air intakes, etc.	1,130	2.26
Airscrews complete	1,580	3.16
Total power installation	10,330	20.66
Fuel and Oil System		
Permanent fuel tanks and supports	210	0.42
Fuel piping system and fuel in pipes	350	0.70
Oil tank and supports	90	0.18
Oil piping system and oil in pipes	70	0.14
Total fuel and oil system	720	1.44
Auxiliary Power Services		
Hydraulics	250	0.50
Pneumatics	30	0.06
Electrics	750	1.50
Total auxiliaries	1,030	2.06
Manufacturer's bare weight	28,130	56.26
Accessories		
De-icing	354	0.71
Fire precautions	230	0.46
Instruments (engine, navigational and flying)	100	0.20
Auto-controls	180	0.36
Radio and radar	550	1.10
Fixed galley equipment	240	0.48
Drinking and washing water, de-icing and other fluids	176	0.35
Furnishings, sound-proofing, air conditioning and other equipment	3,360	6.72
Weight empty	33,320	66.64
Disposable Load		
Removable galley equipment	220	0.44
Crew, including maps and other navigational instruments	750	1.50
Stewards		
Passengers and luggage		
Mail and freight	15,710	31.42
Fuel and oil		
All-up weight	50,000	100.00

THE DESIGN-STUDY . . .

I have evolved a brief method of performing a preliminary design-study, whereby certain weight, performance and stability criteria are tied down in reasonable approximations. The method makes it possible for a designer to carry out a design-study in a matter of hours, and has been used successfully by the author in lieu of the well-recognized formulae. The orthodox, unabridged methods have frequently been largely negatived by some change in the size and weight of equipment, or by some unaccounted-for drag. All too frequently when such an omission is discovered, everyone concerned loses patience, and the calculators themselves lose faith in their calculations and start approximating. By contrast, the use of approximate formulae from the start makes it possible to calculate more variants to the same specification, and to proceed with project sketching at the same time.

The following method of preliminary design-study permits calculation of the conventional aircraft dimensions as a function of the desired structure weight, providing that the following specification demands are stated :

(1) Performance requirements :

1.1 Required take-off distance to 50ft screen.
1.2 Required minimum rate of climb.
1.3 Required minimum cruising speed.
1.4 Required landing distance from 50ft screen.

Sometimes, a few additional requirements are given :

1.5 Maximum range (for long-range aircraft irrespective of speed).
1.6 Stalling speed with appropriate load, flaps up or down.

In most cases, the first four of the above requirements are the most severe and, consequently, the method presented here has been based on them. If necessary, however, the last two requirements can be evaluated separately, and "offered-up" to the dimensions previously derived.

(2) Determination of values independent of wing size and area :

The following items have to be determined first, and independently of the final aircraft dimensions :

2.1 *Aircraft all-up weight minus structure weight.*

This comprises disposable load (crew, passengers, luggage, fuel and oil, furnishing), plus engine installation complete with fuel and oil installation (tanks and pipes), power services, including electrics, hydraulics and pneumatics. A good approximation to the weights of all the items listed above can conveniently be taken from the weight breakdowns available for similar existing types of aircraft. Such a breakdown is shown in Table 1 (Ref. 2).

In order to choose the correct engine power relative to engine weight, and so ensure prevention of the aircraft being underpowered, it is wise to provide for a power loading not greater than 8.5 lb/take-off b.h.p. (Ref. 3.)

2.2 *Fuselage and nacelle sizes and cross-sectional areas.*

These can be determined from the following formulae :

Fuselage: $A_F = 0.15 \times (\text{payload})^{\frac{2}{3}}$ .....(Ref. 3)

Nacelle: $A_N = K \times$ T-O b.h.p. where $K = 0.0042$/T-O b.h.p. for turboprops.

$K = 0.0050$/T-O b.h.p. for piston engines.

2.3 *Empennage size approximation.*

This can be obtained from the following formulae (Ref. 4) :

$\frac{S_T \times L_T \times L_{FF}}{S_{FP} \times S_{FS}}$ = 4.0 for multi-engined aircraft } for tailplane and
= 3.0 for single-engined aircraft } elevator
= 3.0 for multi-engined aircraft } for fin and rudder
= 2.5 for single-engined aircraft } for fin and rudder

where S_T is empennage nett area excluding the fuselage.
L_T is empennage moment arm from the aircraft's c.g.
L_{FF} is front fuselage length ahead of the wing.
S_{FP} is fuselage area in plan form ahead of the wing.
S_{FS} is fuselage area in side view ahead of the wing.

Note: Fin and rudder area calculated to this formula do not include the fuselage side area immediately under the tailplane on single-fin aircraft. The latest tests indicate a very poor fin efficiency under the tailplane. (Ref. 4.)

2.4 *The parasitic drag* of the aircraft can now be expressed in terms of the wing area, provided that the items under paras. 2.2 and 2.3 have been determined.

$$C_{D_0} = C_{D_0}\text{wing} + \frac{C_{D\text{fus}} \times A_F + C_{D\text{emp}} \times (S_{TP} + S_{FR}) + C_{D\text{nac}} \times A_N}{S} + \Delta C_{D_0\text{F}}$$

where C_{D_0} wing, C_D fuselage, C_D nacelles, C_D empennage, and ΔC_{D_0} flaps have values as suggested in Refs. 5 and 6.

For very rough calculations, the following formulae have been successfully used by the author :

2.4.1 *Wing drag:*

C_{D_0} wing $= C + 0.001$ (log V m.p.h. + log $\bar{c} - 4.075)^2$ for mean t/c = 0.15.

where $\bar{c}$ = wing mean chord.

$C = 0.0038$ for laminar sections with transition at 0.5c.
$= 0.0068$ for conventional sections with transition at the leading edge and a substantially linear variation between them for the appropriate transition.

2.4.2 *Fuselage drag:*

C_D fuselage $= 0.078$ on transport types, good multi-panel windscreen.
$= 0.105$ on transport types, blunt Vee windscreen.
$= 0.07/0.08$ on fighter types, excluding windscreen.

2.4.3 *Windscreen drag:*

C_D windscreen $= 0.03$ for best streamlined canopies, no flat panels, no sharp corners.
$= 0.10$ for average type, no flat panels, but with retaining strips.
$= 0.34/0.40$ for blunt panels with sharp corners, or conical-type screens.

All the coefficients in paras. 2.4.2 and 2.4.3 above refer to fuselage or windscreen cross-sectional areas. (Ref. 7.)

2.4.4 *Empennage drag:*

$C_D = 0.008$ for good, thin (0.09/0.12 t/c) sections, sealed gaps.
$= 0.01$ for average surfaces, including control gaps.

2.4.5 *Nacelles* (cross-sectional area):

$C_D = 0.10$ for good nacelles with minimum leaks.
$= 0.13$ for poor nacelles with leaks and wheel doors badly sealed.

2.4.6 *Undercarriage drag* (u/c frontal area in "down" position) :

$C_D = 0.18$ for good, fully spatted leg with faired wheels.
$= 0.7$ for spatted leg with unshielded wheel.
$= 1.0$ for totally exposed single-strut leg, unshielded wheel.
$= 1.3$ for exposed girder-type leg, unshielded wheel.

Note: By arranging that the fairing doors close off the larger part of the retraction well whilst the undercarriage is still extended (during take-off and climb), the undercarriage drag on two well-known civil aircraft has been reduced to less than 60 per cent of its original value, and has enabled these aircraft to fly comfortably on one engine with the undercarriage down. For twin-engined aircraft, this configuration is, of course, one of the most stringent performance requirements.

2.4.7 *Dead-engine airscrew drag:*

The drag of a windmilling airscrew is one of the most difficult quantities to estimate, for it varies with throttle and ignition setting as well as airscrew blade pitch setting. Average values can be derived from the following formulae :

Drag, pounds, at 100ft/sec $D_{100} = ND^2/K$
where $K = 67$ for airscrew stopped, blades feathered.
$= 18$ for airscrew windmilling, coarse pitch.
$= 5$ for airscrew windmilling, fine pitch.
D = airscrew diameter, feet.
N = number of blades.

Note: It is apposite to point out that the drag of the dead airscrew causes some additional drag owing to rudder and aileron deflection required, and this consequently increases the induced and profile drags. This asymmetric power drag is difficult to estimate quickly, as it depends to a great extent on the rudder and aileron size, empennage and wing configuration and aspect ratio. Curiously enough, however, the additional drag represents almost a constant value expressed in terms of horsepower throughout the speed range, and can be taken to equal the drag of the dead engine (also expressed in horsepower) calculated in accordance with the above formula, at the minimum control speed. In other words, the horsepower required to fly with one engine dead equals the standard drag horsepower plus the double drag horsepower of the windmilling airscrew.

(3) Determination of aircraft structure weight and dimensions :

3.1 *Aircraft structure weight:*

This quantity depends primarily on the spanwise load per inch chord, and secondly, on stiffness requirements. These, in turn, depend on (a) wing area, loading, span, root t/c ratio and ultimate factor; (b) fuselage length and surface area; (c) empennage area; (d) undercarriage factors and size; and (e) nacelle size. It should here again be remembered that every one per cent reduction in structure weight for a conventional aircraft means 4 to 5 per cent increase in payload for the same performance.

3.1.1 *Wing structure weight:*

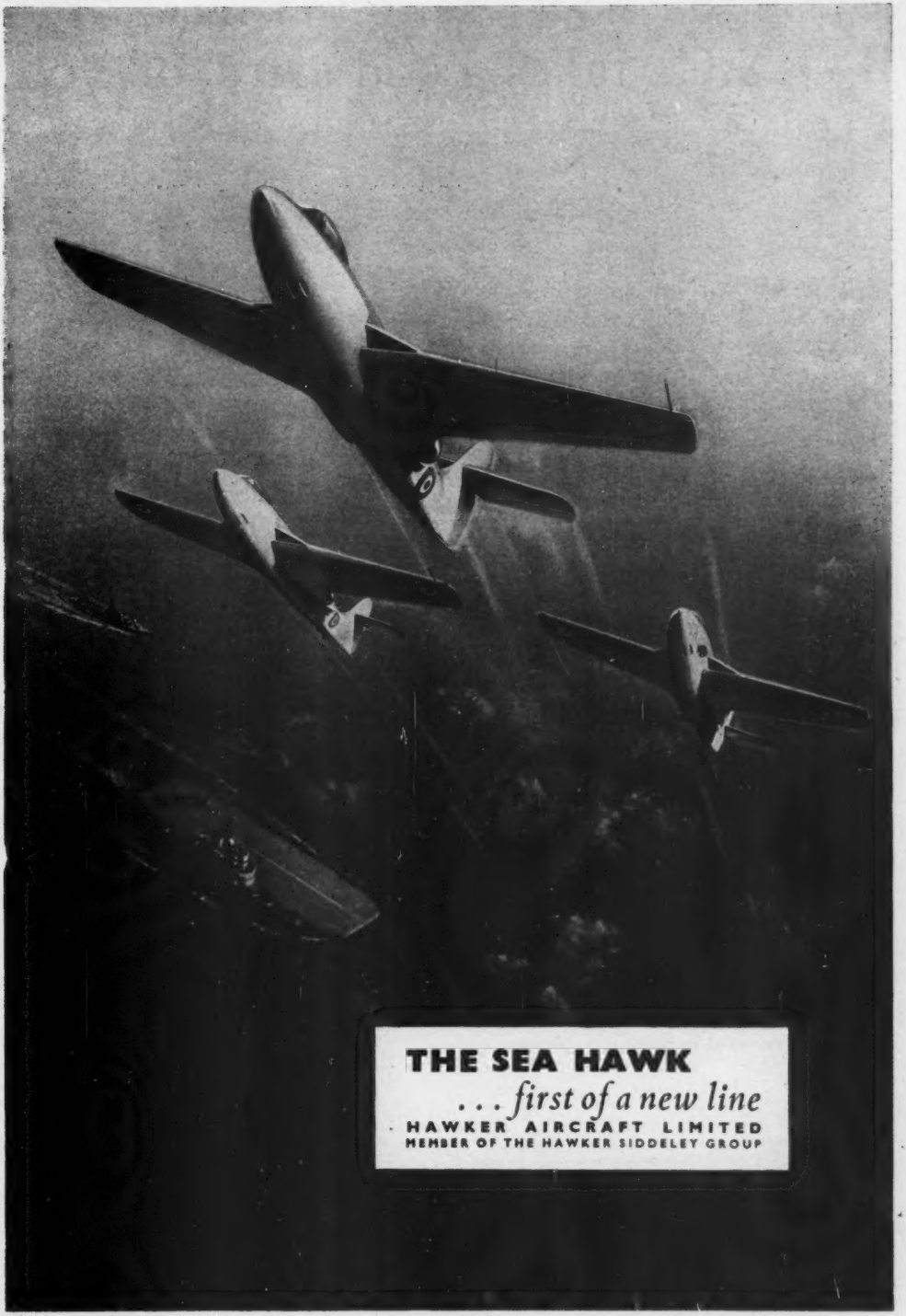
There are several wing structure formulae; that used by the Lockheed Aircraft Corporation for their large civil aircraft is as follows :

$$(W_w/W) \text{ per cent} = 7.6 + \frac{(\text{a.u.w.})^{\frac{1}{3}}}{48.5}$$

Alternatively, the author has used the following formula (derived from Ref. 8 and simplified) for light aircraft :

$$(W_w/W) \text{ per cent} = N \times b \times (0.00027 \times \frac{A}{t} + 0.008) + \frac{90}{w} + 5.0$$

where N is the ultimate load factor and A, b, t, w are the wing aspect ratio, span, root t/c ratio, and loading respectively.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THE DESIGN-STUDY . . .

3.1.2 *Fuselage percentage structure weight:*

(W_f/W) per cent $= 100 \times \frac{S_F}{\text{a.u.w.}} + 5.0$, where S_F = fuselage surface area (Ref. 9).

Alternatively, (W_f/W) per cent $= 336 \times \frac{P^{2/3}}{\text{a.u.w.}} + 5.0$, where P = payload required, pounds.

3.1.3 *Empennage and controls weight:*

(W_e/W) per cent $= 100/w$, where w = wing loading (simplified expression derived from Ref. 9).

3.1.4 *Undercarriage structure weight:*

(W_u/W) per cent $= 1.5 + 0.04 \times v^2$, where v in ft/sec is the design vertical velocity, usually 8 to 12ft/sec.

It must be emphasized in this connection that the nosewheel-type undercarriage need not necessarily be any heavier than a tailwheel installation, provided that the aircraft is designed for it from the beginning. (Ref. 1.)

3.1.5 *Nacelle structure weight:*

(W_n/W) per cent $= \frac{20}{W/\text{b.h.p.}}$ where W/b.h.p. is the take-off power loading.

Having decided on certain constants, we can now express our structure weight in terms of the coefficients we have derived, and can thus draw curves of all-up weight versus aspect ratio and wing loading, or any other values made variable. These weight curves will form the *minimum obtainable weight* pattern. On the other hand, the aerodynamic requirements listed above and discussed in detail hereafter will form the pattern of *permissible maximum weight*. The intersection of these two nests of curves will give us the ideal aircraft within the framework of the specification. Let us, therefore, now turn to the aircraft dimensions required to meet the aerodynamic performance demands.

3.2 *Computing wing area required for the demanded take-off distance to 50ft:*

The following very simple expression (first suggested, I believe, by Mr. T. P. Wright) gives a good approximation:

$(l_{T\text{-}O})$ yd $= K \times \frac{\text{a.u.w.}}{\text{b.h.p.}} \times \frac{\text{a.u.w.}}{S}$ where K = a constant depending on the type of flap to be used, and the take-off parameter. The I.C.A.O. take-off parameter, for example, requires the aircraft to be accelerated up to take-off safety speed, whereas the $1.2V_S$ parameter permits take-off and climb at $1.2\times$ stalling speed with flaps and undercarriage in the take-off configuration. The values of K have been evaluated as mean terms from Table 2, and are presented below in order to enable the wing area to be calculated if the all-up weight and take-off b.h.p. are known.

TABLE II: MODERN CIVIL AIRCRAFT TAKE-OFF DISTANCES

Aircraft	T-O wing loading lb/sq ft	T-O power loading lb/ b.h.p.	Flap type	T-O to 50ft (ft)	ICAO T-O	K 1.2V_S	K ICAO	Remarks
1. Rapide	16.5	13.9	Split	1,535	—	2.23	—	
2. Consul	23.7	9.4	Split	1,440	—	2.15	—	
3. Beech 18 ...	24.4	9.45	Split	1,650	—	2.39	—	
4. Dove	25.4	12.5	Plain	2,370	4,290	2.49	4.51	
5. Avro XIX ...	22.5	12.4	Split	2,100	—	2.5	—	
6. Prince	29.2	10.2	Slot'd	1,836	3,060	2.06	3.44	
7. Lodestar ...	33.5	8.4	Fowler	1,700	—	2.01	—	Small-span flap
8. DC-3	25.6	11.5	Split	2,000	—	2.26	—	
9. Scandia	35.1	9.8	Slot'd	1,935	3,690	1.9	3.62	
10. Viking	36.9	9.4	Split	2,550	3,600	2.46	3.47	
11. Martin 202 ...	44.4	9.5	D'ble slot'd	1,565	3,510	1.42	3.18	0.75 span flap
12. Wayfarer ...	26.9	11.8	Split	2,310	3,690	2.43	3.88	
13. Convair 240 ...	49.6	9.6	Fowler	—	4,250	—	3.37	
14. Bellatrix ...	44.2	10.25	Slot'd	2,980	5,575	2.19	4.10	
15. Ambassador I ...	39.1	8.7	Split	2,640	3,900	2.59	3.83	
16. Marathon ...	33.0	12.5	Fowler	2,440	—	1.97	—	
17. Northrop Pioneer	25.0	11.46	D'ble slot'd	1,170	—	1.36	—	Full-span flap and spoiler ailerons
18. Viscount ...	53.0	10.0	D'ble slot'd	3,090	—	1.94	—	
19. Languedoc 161 ...	43.0	10.7	Slot'd	2,870	4,840	2.08	3.51	
20. S. Marchetti SM95	38.3	11.0	Slot'd	3,000	—	2.37	—	
21. Boeing Stratoliner	36.3	11.25	Split	2,950	4,000	2.41	3.27	
22. Lancastrian ...	50.0	9.9	Split	3,600	—	2.22	—	
23. York	55.7	10.8	Split	5,640	—	3.18	—	
24. DC-4	50.1	12.4	Slot'd	3,900	5,500	2.09	2.95	
25. Tudor IV ...	56.3	11.5	Split	5,250	—	2.78	—	
26. Canadair 4 ...	55.1	11.4	D'ble slot'd	2,900	5,000	1.71	2.95	
27. Hermes IV ...	58.2	9.75	Slot'd	4,200	—	2.46	—	Very small chord flap
28. DC-6	66.7	11.1	D'ble slot'd	—	5,830	—	2.48	
29. Breda Z308 ...	46.5	10.35	Split	—	4,600	—	2.87	
30. Constellation 649	57.0	9.40	Fowler	3,060	4,200	1.90	2.35	
31. Constellation 749	63.7	10.50	Fowler	3,850	5,200	1.92	2.33	
32. Stratocruiser 377	78.5	9.65	Fowler	4,000	5,380	1.54	2.37	Large-span flap
33. S.E. 2010 ...	62.5	12.10	Slot'd	5,900	—	2.36	—	
34. Constitution ...	51.0	13 20	Fowler	4,320	—	1.92	—	

TABLE III: MEAN VALUES OF TAKE-OFF DISTANCE CONSTANT, K

T-O parameter	Engines	Split flap	Slotted flap	Double-slotted flap	Fowler flap	Full-span flap, double-slotted or Fowler type
1.2V_s ...	2	2.4	2.1	1.8	1.7	1.4
	4	2.65	2.25	1.85	1.85	—
I.C.A.O. ...	2	3.9	3.7	3.6	3.4	3.2
	4	3.3	3.2	2.7	2.3	—

The importance of efficient flap design is exemplified by applying the above formula to a twin-engined aircraft where, by using a large-span Fowler or double-slotted flap, instead of a plain, split-type flap, the all-up weight of the aircraft can be increased by 31 per cent for the same take-off distance to 50ft. Alternatively, for the same weight, power and take-off distance, the wing area can be reduced to 60 per cent of the standard.

A much better approximation to the take-off distance can, however, be obtained by the following formula, the so-called "mean speed" method. The total take-off distance consists of the ground run, transition distance and climbing distance to 50ft, all distances being expressed in feet.

Ground run $s_1 = \frac{W}{z_g} \times \frac{V_{T\text{-}O}}{(\overline{T} - \overline{D})}$

Where $V_{T\text{-}O}$ = take-off safety speed, ft/sec.

$\overline{T}$, lb, = thrust at mean speed $\overline{V} = 1/\sqrt{2} \times V_{T\text{-}O}$

$\overline{D}$, lb, = drag at mean speed $\overline{V} = 1/\sqrt{2} \times V_{T\text{-}O}$

$$= \left(C_{D_0} + \frac{1}{\pi} \frac{C_{LO}^2}{A} + \mu C_{LO}\right) \times \tfrac{1}{2}\rho \overline{V}^2 \times S + \mu W$$

C_{LO} = ground incidence $C_L = \mu \times \pi \times A$ for best ground run (Ref. 1).

μ = ground friction coefficient, 0.03/0.10

Transition period run $s_2 = (V_{T\text{-}O}$ ft/sec). A transition time of one second has been assumed.

Climbing distance to 50ft $s_3 = 50 \times \frac{W}{T - D}$

Where T = thrust at take-off safety speed (from airscrew thrust curve).

D = drag at take-off safety speed

$$= \left(C_{D_0} + \frac{k\, C_{L\,T\text{-}O}^2}{\pi A}\right) \times \tfrac{1}{2}\rho\, V_{T\text{-}O}^2 \times S$$

This method gives excellent results even when compared with the step-by-step integration method, the accuracy being, in fact, within 2 per cent for conventional aircraft.

If the all-up weight variation with wing area can be approximated, then the take-off distance to 50ft can be calculated and plotted with the wing area as a variable for different flap and airscrew arrangements. In this way, the wing area required for a specified take-off distance can be found.

3.3 *Computing wing loading for a demanded landing distance from 50ft:*

If the maximum landing distance from 50ft is included in the specification, the wing area determined from para. 3.2 should be checked against this requirement. This check can be done by either of the two methods given below. The first is simple, but is very approximate, and relates landing distance to wing loading, namely:

Where w = landing wing loading, then

$l = \text{const} \times w$ const = 24.4 for split flaps
= 23.8 for slotted flaps
= 17.3 for double slotted or Fowler flaps

The above coefficients have been based on statistical data given in Fig. 1, where required landing-field lengths have been plotted against wing loadings for 47 different types of aircraft and 91 different landing wing-loadings.

If a greater accuracy is required for computing the landing distance, the following method is recommended as giving close results. The total landing distance is assumed to comprise the gliding distance from 50ft, the flare-out distance and the touch-down-to-stop distance.

Gliding distance $s_1 = 50 \times \frac{L}{D}$ where $\frac{L}{D} = \frac{C_L}{C_D}$ at approach safety speed V_A

$V_A = 1.1$ to $1.3V_S$ depending on requirements.

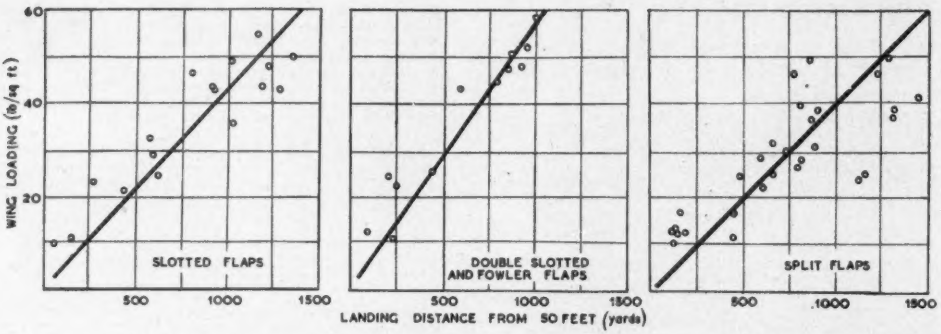

Fig. 1. Plot of wing loading against landing distance for various flap configurations on 47 types of aircraft and at 91 different wing loadings.

THE DESIGN-STUDY . . .

Flare-out distance $s_2 = \left(\frac{\overline{C}_L}{\overline{C}_D} \times \frac{V_S^2}{2g}\right)\left[\left(\frac{V_A}{V_S}\right)^2 - 1\right]$

Where $\overline{C}_L = \frac{2 \times C_{Lmax}}{\left(\frac{V_A}{V_S}\right)^2 + 1}$

$\overline{C}_D = C_{D_0} + \frac{k\overline{C}_L^2}{\pi A}$

Touch-down-to-stop distance $s_3 = \frac{W}{2g} \times \frac{V_S^2}{D_B + D_A}$

Where D_A = aerodynamic mean drag, lb

$= \left(C_{D_0} + \frac{1}{k}\frac{C_{LG}^2}{\pi A}\right) \times \frac{1}{2} \rho \overline{V} \times S$

D_B = braking mean drag, lb

$= \mu \times (W - C_{LG} \times \frac{1}{2} \rho \overline{V}^2 \times S)$

$\overline{V} = \frac{V_S}{\sqrt{2}}$

C_{LG} = lift coefficient at ground attitude

μ = mean braking coefficient

= 0.15 for wet grass

= 0.30 for dry concrete.

3.4 *Computing aspect ratio for a required rate of climb.*

Having fixed the wing area and wing loading according to the take-off and landing distance requirements, we can now proceed to estimate the parasitic drag of the aircraft from equations in para. 2.4 according to the particular configuration at which the specified rate of climb is required. Having obtained the parasitic drag C_{D_0} we can now calculate the minimum wing aspect ratio A which will give us the required rate of climb. Unfortunately, the ideal induced drag is seldom realized in practice, for the fuselage and nacelles usually reduce the geometric aspect ratio by the factor of $\frac{1}{k}$, k being the induced drag factor. In this connection, the greater the aspect ratio, the greater the induced drag factor owing to the increased influence of the fuselage on a wing of narrow chord. This effect is shown in Fig. 3, where two experimental curves have been drawn through a large number of points. The required aspect ratio A is related to k in the following equation :

$$\left(\frac{k}{A}\right)^{\frac{1}{2}} = \frac{33{,}000 \times \frac{\text{b.h.p.}_o}{W} \times \eta_C \times f(h) - (R.o.C.)}{1480 \times \sqrt{\frac{w}{\sigma}} \times C_{D_0}^{\frac{1}{2}}}$$

Where b.h.p.$_o$ = total engine power at sea level

η_C = airscrew efficiency at climbing speed (by S.B.A.C. method)

$f(h)$ = engine power reduction factor due to height (Fig. 2)

$R.o.C.$ = required rate of climb, ft/min

σ = relative density ratio at height (Fig. 2)

w = wing loading, lb/sq ft

C_{D_0} = profile drag coefficient for the given configuration

k = induced drag factor (Fig. 3)

A = required minimum aspect ratio.

This equation gives very close results when applied to conventional aircraft flying between sea level and the maximum throttle height. It does, however, over-estimate the required aspect ratio for great heights and small powers, or both.

3.5 *Checking wing loading and aircraft drag for maximum cruising speed.*

From a detailed survey of various modern aircraft, the author

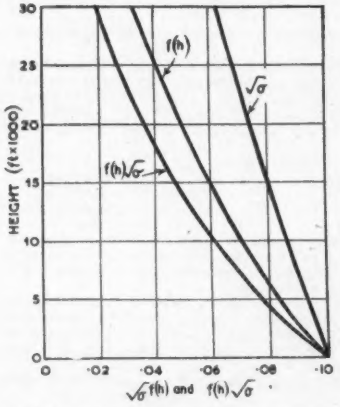

Fig. 2. Curves of engine power reduction as an effect of relative density variation with altitude.

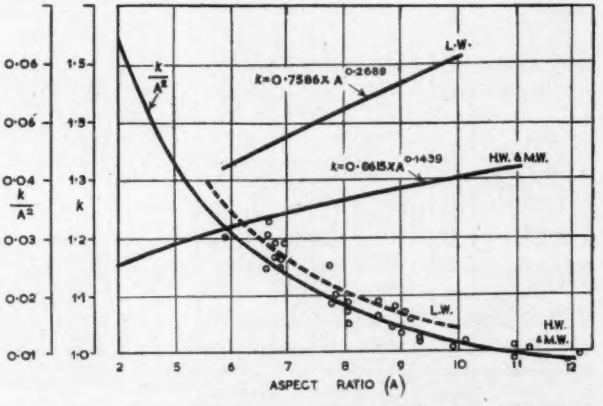

Fig. 3. The greater the aspect ratio the greater the induced drag factor. Experimental curves for low-, mid-, and high-wing configurations.

has found that most of them cruise at $C_L \doteqdot 0.40$. This fact provides a useful guide to the cruising condition of any new project and yields the following approximation :—

$$w = \sigma \times V_C^2 \times 10^{-3}$$

Where σ = relative density at height
V_C = true cruising speed, m.p.h.
w = wing loading at height.

The engine cruising power should also be checked for this speed and height from the following approximation :

$$\text{b.h.p.}_o = \frac{6.8 \times 10^{-3}}{\eta \times f(h) \sqrt{\sigma}} \times \left(C_{D_0} + 0.05 \frac{k}{A} \right) \times \text{a.u.w.} \times V_C$$

Where η = airscrew cruising efficiency (by S.B.A.C. method)
$f(h)$ = engine power height factor (Fig. 2)
C_{D_0} = profile drag coefficient calculated from para. 2.4
k/A = induced drag factor and aspect ratio (Fig. 3)
b.h.p._o = equivalent engine b.h.p. at sea level.

It should here be mentioned that in a case where the true engine power at height is known, no engine height factor need be used. It might also be mentioned that, when relating the two above equations together, the first approximation provides a guide both to a range of cruising speeds which can be expected when the fuel load is varied, and the speed range for which the airscrew efficiencies have to be calculated. Anyone who has had to perform many airscrew calculations will agree that the fewer the speeds for which these tedious estimates must be made the better, if only as a result of their time-consuming nature.

3.6 *Maximum range required.*

It has been demonstrated (Ref. 10) that maximum range as calculated by the Breguet formula can, in fact, be increased by as much as 5 per cent when the weight change is taken into consideration in aerodynamic coefficients. Thus, by introducing the factor of 1.05 to replace the usual term of $\frac{L}{D}$ in the Breguet formula, we get :

$$R = 800 \left(\frac{\eta}{c} \times \sqrt{\frac{A}{k C_{D_0}}} \right) \times \log_{10} \left(1 + \frac{W_{\text{fuel}}}{\text{a.u.w.}} \right)$$

Where η = airscrew efficiency at cruising speed
c = specific fuel and oil consumption. (This is usually between 0.47 and 0.50 lb/b.h.p./hr).

3.7 *Stalling speed, power-off*

This item usually has to be checked, either to satisfy a requirement in the specification, or alternatively, to make sure that the proposed aircraft falls into an appropriate category; for example, the A.R.B. and C.A.A. stipulate that the stalling speed of a light aircraft must be less than 70 m.p.h.

In order to estimate stalling speed accurately, the wing section $C_{L_{max}}$, the wing position, fuselage and nacelle cambers, flap type, chord and span, have to be known. However, for a first approximation check, the following formula might well prove sufficient :

$$V_s = \text{constant} \times \sqrt{w}$$

Where constant = 15.0 for average split flap
= 13.8 for slotted flap
= 12.8 for Fowler flap
= 12.5 for double-slotted flap
= 11.8 for double-slotted flap and leading edge slot
V_s = stalling speed (m.p.h.) with flaps down.

In conclusion, it only remains to be stated that, having obtained the preliminary dimensions and weight of our projected aircraft on the basis of the formulae outlined, a "pretty picture" can now be drawn and the balance for various loadings calculated, together with the proper performance and stability analyses. It is, of course, quite possible that some dimensions might have to be changed in the light of subsequent events but, nevertheless, we can be fairly sure that we shall have an aircraft as close as possible in character to that demanded by the specification.

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CANADIAN INDUSTRY'S BIG ORDERS

WITHIN six months Canada will be delivering at least three types of aircraft to the U.S. Air Force, and the value of the combined orders may reach $100,000,000.

Two of the contracts are still being negotiated. Only one has been finally signed and sealed; as reported in *Flight* of July 27th, it is with the de Havilland Aircraft Co. of Canada and calls for over 100 D.H. Beavers, for communications and light transport work, at $35,000 apiece. When authorizations are granted, Canadair, Ltd., and the Canadian Car and Foundry Co. are to build, respectively, an estimated 300 Beechcraft T-36A trainers and 1,000 Harvards.

The de Havilland contract is of particular interest in that it is the thin edge of the export wedge so far as Canada is concerned, and one that threatens to penetrate the formidable barrier known as the Buy-America Act.

Several years ago the U.S. Air Force attempted to purchase Beavers. A procurement order was issued by the U.S.A.F. search and rescue establishment in Alaska, requesting two dozen of the Canadian craft for "bush" work. The order was never given official sanction.

Lobbyists of the influential U.S. industry, flaunting before Washington officials stories of empty plant space and untested production potential, waged a successful fight to invoke the 1933 Buy-America Act every time there was a possibility of orders going to Canada. It was not until early this year that the de Havilland Company was given a test order for six of its Beavers, two for the U.S.A.F. and four for the U.S. Army. Later, de Havilland were invited to participate in a competition for liaison aircraft: the Beaver topped the field with ease.

A few months ago the order mentioned above arrived, and a further order is expected at any moment.

Canadair, meanwhile, is gearing its assembly lines to build the entirely new T-36A, a twin-engined trainer-cum-transport. The Canadair deal, still short of finalization, is the result of three factors: (1) The production experience and the uncommitted plant space of the Canadair firm; (2) the lack of plant space at Beechcraft's Wichita, Kansas, factory; (3) the increasing pressure felt by Washington from Canada's Defence Production Department.

While the estimated quantity for export is 300 aircraft, it is highly probable that Canadair will receive extra orders for the trainer from the R.C.A.F.

Canadair's Montreal plant is engaged on yet another project—planning for the production of 500 Lockheed T-33 two-seat jet trainers for the R.C.A.F.; at the moment, the supply of power units constitutes a problem.

Canadian Car and Foundry were authorized several months ago to prepare space and equipment sufficient to turn out 1,000 Harvards. These aircraft are to constitute a pool available to members of the North Atlantic Treaty. The largest number will go to the R.C.A.F.; others will be shipped to the U.S. and Europe.

In the field of engine construction, also, some big orders have lately been placed by Canada's Defence Production Department. The largest of them is a $17,000,000 contract to modify and repair Merlin aircraft engines in Montreal.

This order has gone to Bristol Aeroplane Engines (Eastern) Ltd. Officials of the company said that the money will be devoted to a four-year modification and overhaul programme, already started, covering Rolls-Royce Merlin engines used principally in North Star aircraft.

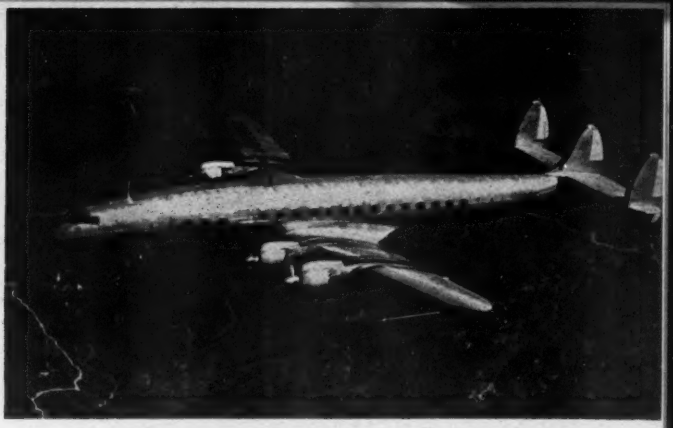
Bristol Aeroplane Engines, Ltd., was formerly Canadian Wright, Ltd. The assets of Canadian Wright were purchased earlier this year by the Bristol Aeroplane Co., and the name changed with effect from July 1st.

TURBOMECAS IN ENGLAND

ON August 2nd, in the Londonderry House library a number of aviation personalities drank cocktails and studied three Turbomeca gas turbines at the invitation of F. G. Miles. In addition to actual examples of the Pimedon, Artouste, and a Marbore I, there were cut-away perspective drawings on the walls of the Aspin I, Palas, Palouste and Artouste. These were complemented by outline drawings of suggested applications for the Marbore 2; a conversion of the Percival Provost; a swept-wing guided missile; an elementary trainer; and a radio-controlled target with high aspect-ratio swept-wings and butterfly tail.

Mr. Miles hopes to use these remarkable little gas turbines in his new aircraft if he receives the slightest encouragement; and, we gathered, the Cirrus side of Blackburns are more than casually interested in arranging a licence agreement with Turbomeca for the manufacturing rights in this country.

CIVIL AVIATION



FIRST FLIGHT of Lockheed's promising L-1049 Super Constellation took place in California last month. The aircraft is 18·4 ft longer than the basic "Connie" and is stressed for conversion at a later date to turboprop power. Sixty-two have already been ordered by airlines.

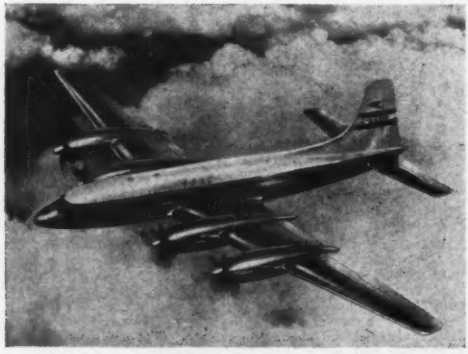
B.O.A.C.'s BETTER PROSPECTS

AS reported briefly in *Flight* last week, B.O.A.C. has managed to achieve a quarterly profit for the first time since the Corporation was formed. The period in question was from April to June and the surplus amounted to £40,000. Although, of course, this profit is a result of a purely seasonal traffic increase, it is, nevertheless, convincing evidence of B.O.A.C.'s improving financial status. Whereas in March, 1949, the break-even load-factor was 100 per cent, today it has been reduced to the commercially attainable figure of 70 per cent. It is expected that when the accounts for the financial year 1950-51 are published they will show an overall improvement of over £3,000,000 as compared with last year's deficit of nearly £8,000,000.

Apart from the encouraging increase in traffic receipts, this result has been due also to the exercise of stringent economies. The Corporation's personnel strength, for example, has been reduced from 23,300 in March, 1948, to a present-day figure of approximately 16,000. Capacity ton-mileage flown per annum has been increased from 91 to 170 million over the same period. There has also been a remarkable rise in productivity, the capacity ton-mile output per employee having risen from 3,750 in March, 1948, to 10,500 today. This increase in capacity is mainly the result of bringing into service a compact fleet of aircraft of considerably larger payload than those previously operated. The actual number of revenue earning machines on the Corporation's strength has, in fact, been reduced from 130 in 1948 to approximately 70 today.

Provided that the atmosphere of the international scene remains on a peaceful level, it seems reasonably certain that the introduction—now not far distant—of such potential money-makers as the D.H. Comet and later, the Bristol 175 will be quickly followed by the announcement of B.O.A.C.'s first annual profit.

Incidentally, the latest estimate of the date of introduction of the D.H. Comet on scheduled passenger services is January next, when it will be placed in service on the London-Cairo route. It is planned to operate the London-Johannesburg service with this type in the following month.



"IN SERVICE, 1953," is the hope of B.O.A.C. for the Bristol Mk. 175 long-range transport, of which this is a new impression by an artist. These machines will carry 50 passengers in luxury accommodation and 92 in "coach-class" comfort. The power units are Proteus turboprops.

CORPORATION PILOTS' PAY

REVISED salary scales for pilots employed by the British Airways Corporations were announced after a meeting of representatives of B.A.L.P.A. and of B.O.A.C. and B.E.A. on August 2nd. The rates, which are retrospective to February 15th last, constitute a re-assessment of pilots' remuneration in the light of exceptional developments, both technical and operational, since the previous scales were settled in 1947. The rise in the cost of living since that year has also been taken into account.

It is understood that the negotiations were conducted solely on behalf of Corporation pilots and do not concern any pilots employed by charter companies. Because the maximum salaries for Corporation First Officers are now likely to exceed those of some charter captains, it seems probable that similar negotiations on behalf of the latter may be expected in the near future. The new rates, together with previous scales awarded by the Industrial Court in 1947 are as follows :—

Rank		Minimum	Increment	Maximum
Second Officers	...	£815 (£600)	£30 (£25)	£935 (£700)
First Officers	...	£1,035 (£750)	£30 (£25)	£1,305 (£900)
Junior Captains	...	£1,335 (£1,000)	£50 (£45)	£1,535 (£1,180)
Senior Captains (2nd Class)	...	£1,585 (£1,200)	£55 (—)	£1,915 (£1,480)
Senior Captains (1st Class)	...	£2,150 (£1,500)	— (—)	— (£1,650

AIR FRANCE MAKES A PROFIT

IN a preliminary annual report of the operations of the French national airline, Air France, in 1950, it was disclosed that the company had made a profit of just over £10,500 in this period. The company's gross revenue rose to £25,800,000, including £16,000,000 from passengers and baggage, £7,000,000 from freight and mail, and £400,000 from special charter flights. Expenditure included a figure of £10,450,000 for salaries and pensions, £5,500,000 for fuel, £5,000,000 for maintenance of aircraft, airports and buildings, and a figure of £2,000,000 which was set aside for depreciation of aircraft and other assets.

At the end of last year Air France was operating 111 multi-engined airliners, including 19 Lockheed Constellations, 28 Douglas DC-4s, 31 Languedocs, and 33 DC-3s. Twelve Vickers Viscounts are also on order for this company, six of which are due for delivery in 1953.

Concurrently with the provisional annual report, Air France has also announced that the order for 10 Lockheed L-1049C Super Constellations has now been finalized. The Air France versions will carry up to 93 passengers each, and will cost approximately $1,500,000 per aircraft; the first machine is due for delivery in March, 1953. As reported elsewhere on this page, the first prototype made its initial flight last month.

Also on order for Air France are a number of S.E. 2010 Armagnac long-range transports and several Bréguet Provence 763 double-deck general utility machines which are capable of offering a particularly large capacity for either passenger or freight operations.

BERLIN'S NEW AIRLIFT

PREPARATIONS are now reported to be in progress to increase the capacity of the new Berlin "airlift" from the present daily load of 80 tons to about 150-200 tons by the second half of this month. The range of goods being carried from Berlin has also been widened extensively. Daily exports from the city amount at present to about 3,000 tons. Of this total 700 tons of merchandise are on the restricted list for which the Soviet Union demands certificates of origin.

At the time of going to press one Tudor was making five flights daily from Berlin to Hamburg, carrying a total of 150 tons a day,

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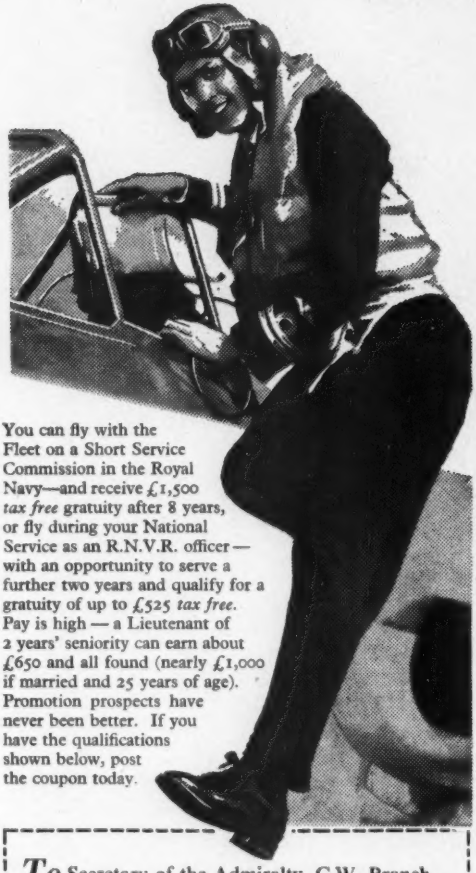

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CIVIL AVIATION . . .

while two French DC-4s were plying with the same frequency between Berlin and Frankfurt. An American DC-4 was also making five flights daily between Berlin and Munich. As far as the general shortage of charter aircraft in Europe is concerned, a slight easing of the situation has apparently followed the British Government's action in making available one or two Yorks for work on the commercial market. These machines were previously being held in a state of readiness to fulfil Government contracts. Smaller aircraft, such as Dakotas and Vikings, are also becoming available now, as most of the tourist commitments for which they were previously booked have now been completed.

HUNTING'S TROOPING CONTRACT

THOUGHT to constitute the largest passenger contract ever awarded to an independent transport operator, a recently concluded agreement between the Air Ministry and Hunting Air Travel, Ltd., will provide for the carriage of Service personnel and their families between the United Kingdom and Malta and Gibraltar. This, incidentally, is the first long-term contract to be awarded by the Air Ministry to a charter firm.

Approximately 30,000 passengers a year will be carried, and the contract will run for a period of two years from August 15th. The service will be provided in accordance with a monthly flight schedule which is to be agreed between the Air Ministry and Huntings during the previous month, the responsibility for the co-ordination of trooping requirements being vested in the Deputy-Director of Movements at the Air Ministry.

It is thought that approximately 40 to 50 round trips per month to each destination will be required, so that a good utilization figure can be expected of Hunting's eight 30-seat Vikings. Hunting Air Travel, Ltd., is one of the Hunting group of companies which, although having their origin in the shipping world in 1874, have since been extended to cover oil and aviation interests.

K.L.M.'s ANNUAL REPORT

THE fact that world rates and fares (adjusted by international agreement through I.A.T.A.) remained low in contrast to the general level of costs is said by K.L.M. to have been the primary factor in bringing about a deficit of 2,230,188 guilders (£210,000) in the company's operations during 1950. Despite the higher price-levels which followed devaluation and the economic effects of international conflict, however, some measure of equilibrium was achieved during the second half of the year as a result of a larger turnover.

Although, like those of other airlines, K.L.M.'s costs were adversely influenced by the political situation and the Korean war, the same factors also led to an increase in the volume of passenger and freight traffic. As far as the accounts were concerned, the deficit was offset against accrued profits for former years so that the company's profit-and-loss account for 1950 actually showed a surplus of 56,000 guilders.

The recently published K.L.M. annual report reveals that the operational volume for the year was increased to nearly 190,000,000 ton/km (as compared with 147,000,000 in 1949), due mainly to the introduction of new services to Germany and the Near East and to increased frequencies on existing routes. Passenger traffic on scheduled services (excluding traffic on the Amsterdam-Jakarta route) was 19 per cent higher than in 1948. In spite of the decline in traffic on the Jakarta service, however, there was still an overall increase of 6 per cent in the passenger traffic results.

COMFORT UNLIMITED: The elegant simplicity and pleasing tones of the interior of B.E.A.'s new Elizabethans strike a note of comfort which cannot fail in passenger-appeal. It is expected that the C. of A. for G-ALZN, the second production aircraft and flagship of the Corporation's Ambassador fleet, will be awarded this week.

At December 31st, K.L.M.'s fleet consisted of 33 DC-3s, 10 DC-4s, 7 DC-6s, 16 Constellations, 12 Convairs and one Auster. Orders have also been placed for seven DC-6Bs and nine Super Constellations, for delivery in 1952-53.

U.S. TRANSCONTINENTAL "COACH" FLIGHTS

UNITED Air Lines' experimental entry last year into the field of "air-coach" operation proved so successful on the Pacific Coast that the company is now planning to introduce a similar service on its coast-to-coast transcontinental route. Application has already been made to the C.A.B. to inaugurate a cut-price run between New York, Chicago and San Francisco on September 30th. Sixty-six-passenger DC-5s are to be used, and initial frequency is to be once daily. One stewardess will be provided on each aircraft, but there is no meal service.

The elimination of luxurious passenger facilities has enabled United to base their fares on a rate of 4.5 cents/mile as compared with the standard rate of 6 cents/mile. The new fare for the New York-San Francisco flight, for example, will be only £110, exclusive of tax. United's action in introducing this transcontinental "coach" rate (the first of its kind, incidentally) has been prompted by the conviction that, under proper conditions, there is little likelihood of too much business being diverted from standard-fare services.

BREVITIES

THE annual conference of the Aerodrome Owners' Association will be held at Bristol on September 5th and 6th. Delegates will be entertained by the Bristol Corporation and the programme will include visits to Filton, Whitchurch and the Yeovil H.Q. of Westland Aircraft, Ltd.

* * *

Sir Patrick Dollan has been re-appointed a director of the Board of British European Airways; he will continue to hold his post of chairman of the Scottish Advisory Council for Civil Aviation.

* * *

A new B.O.A.C. service in the Carribbean area was introduced on August 4th; it links Nassau, Santiago de Cuba and Kingston (Jamaica). Frequency is once weekly in each direction and DC-3s chartered from Bahamas Airways, Ltd., are used.

* * *

B.E.A's Traffic Superintendent, Mr. George Wharton, has been appointed a group commander in the reconstituted Movement Control Section of the Army Supplementary Reserve of Officers, an organization similar to that which existed during the last war. He will hold the rank of colonel, and his officers are to be drawn mainly from the airlines and travel agencies.

Organized under the auspices of the I.C.A.O. Technical Assistance programme, a mission was recently sent to Iran to assist in the expansion and improvement of airports, navigational aids and passenger-handling facilities in that country.

* * *

A joint announcement by B.O.A.C. and Saunders-Roe, Ltd., on Thursday of last week stated that Capt. H. W. C. Alger, the Corporation's highly experienced flying-boat specialist, is to be seconded to Saunders-Roe for development work in connection with the 105-seat Princess.

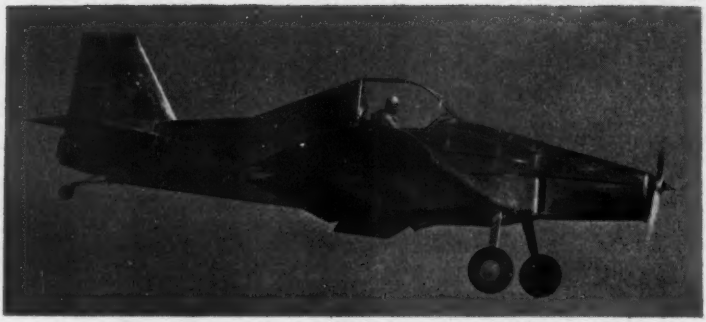
* * *

Bahamas Airways, Ltd., have adopted for their aircraft a new livery closely resembling that of B.A.L.'s parent company, B.O.A.C. The two DC-3s and five amphibians which comprise the fleet will have white tops and a broad blue band running the length of the fuselage.

* * *

During the year ended June 30th, Trans-Australia Airlines flew a total of 238,000,000 revenue passenger-miles, a 15 per cent increase on passenger traffic recorded in the previous year. In the annual report in which these figures were disclosed, it is also

CIVIL AVIATION...



FARMER'S FRIEND: This recent photograph of the American AG-1 "agricultural duties" aircraft reveals it as a low-wing monoplane of unusual proportions; an earlier report had referred to this machine (the first ever to be designed exclusively for agricultural work) as being of high-wing configuration.

stated that the number of airports served by the company during the year under review rose from 56 to 93. This was mainly due to the establishment of extra feeder services within Australia. T.A.A. is a State-owned airline which was established by the Australian Labour Government in 1947, and recorded its first profit after only two years of operation.

* * *

Mr. Russell B. Adams, special assistant to the Secretary of State and a former member of the C.A.B., has been elected vice-president of Pan American World Airways with effect from August 1st. He will represent P.A.W.A. in its negotiations with government departments and international organizations.

* * *

The U.S. Air Co-ordinating Committee has recommended the production of industrial, executive and agricultural light aircraft at a yearly rate of 3,500. The Committee has urged the Defence Production Administration to allow sufficient supplies of controlled material to be diverted to the factories concerned so that the new rate of production can be started in the last quarter of this year. The committee's decision is said to have been based on a new C.A.A. survey which showed that 89 per cent of all light aircraft were now being used for "defence-supporting activities."

* * *

Los Angeles Airways has ordered a second Sikorsky S-55 helicopter. The first machine is scheduled for delivery in November. The order follows a decision by the C.A.B. to grant the company a five-year permit for mail and passenger services in the Los Angeles area.

* * *

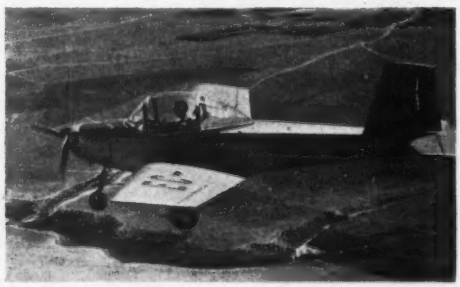
California Central Airlines, the American inter-State operators who pioneered "air coach" travel on the Los Angeles to San Francisco run, are to be re-equipped completely with Martin 2-0-2s taken over from North-West Airlines. The purchase actually amounts to an exchange, for North-West will acquire C.C.A.'s five DC-3s and two DC-4s in addition to an undisclosed balance in cash. C.C.A.'s Martins will fly with 44 seats and the company's present schedules will remain unchanged.

FROM THE CLUBS

IN July, Derby Aero Club achieved the best flying-hour returns in its history, one of the Magisters alone having flown 77 hr 15 min during this period. In submitting this information the club states that it has no wish to join in any contest for free Very pistols (see *Flight*, July 13th), but would like to see its achievement recorded as an example of what high utilization figures can be attained with training aircraft. The combination of good flying weather and a full programme has kept the C.F.I. airborne for the greater part of the daylight hours. Private Pilot's Licence courses were completed by three cadets.

In mid-July the club held a successful summer dance and, on the following day, a landing competition, for a trophy given by the chairman, Mr. C. A. Woodward. Appropriately enough, the trophy was won by its donor, with Mr. J. R. Ratcliffe as the runner-up.

Following this event, club members were able to witness a display of skill in another element, as the Junior County Car Club's meeting and competition was held on the airfield perimeter track.



PRODUCE OF SPAIN: The first flight of the attractive little two-seat Iberavia I-11 took place on July 16th; the pilot was Signor Javier Guibert. Powered by a 90 h.p. Continental engine, the I-11 cruises at a speed of approximately 110 m.p.h., and stalls at about 54 m.p.h.

THE Strathtay Aero Club logged a total of 253 hr in July. Aided by the good weather which prevailed during the month, a number of newly enrolled pilot members have all made rapid progress. Five A.T.C. cadets completed the scholarship course and qualified for their licences during the month.

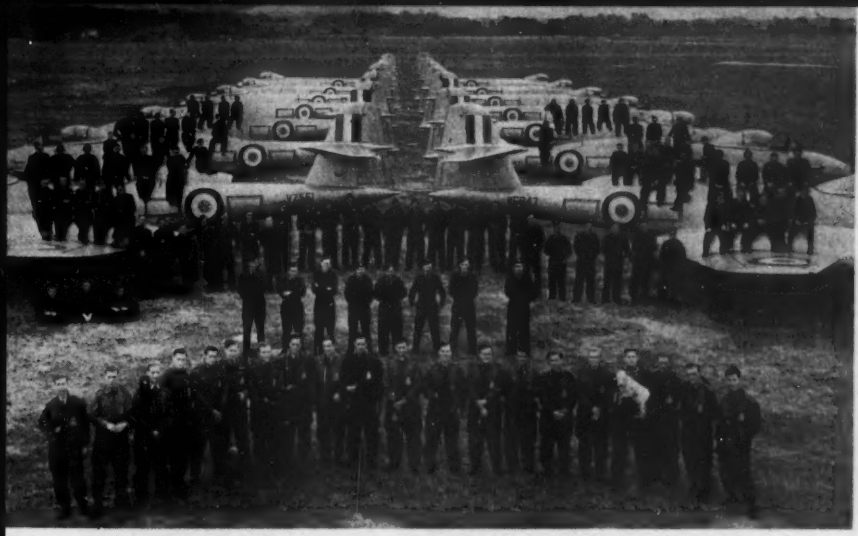
The club's private owner members have also been active, and one who participated in the Le Baule Rally in his own Miles Messenger collected the premier award in the arrival competition.

AT the 44th conference of the Fédération Aéronautique Internationale, held recently in Brussels, a number of new records were added to the list of world records. A distance record in a closed circuit without intermediate landing and a speed record in a 100 km closed circuit were established. The following existing classes were also opened to light aircraft of 500–4,500 kg in the C.1 (a) and C.1 (e) categories : (*a*) a distance record in a closed circuit without intermediate landing; (*b*) a speed record in a closed circuit of 5,000 to 10,000 km; (*c*) a speed point-to-point record and a round-the-world speed record.

In addition, a new point-to-point speed record category for airliners was established. Its principal features are that the course can lie between any two recognized airports used by regular airlines and that the minimum distance is to be 200 km except in the case of international flights.

The F.A.I. Touring Committee also took the opportunity afforded by this meeting to discuss the many difficulties now being encountered by private pilots in making journeys to points outside their own countries. The committee was unanimous in its decision to ask all countries which are signatories of the Chicago Convention to make every effort to secure the removal of the barriers which face private pilots wishing to fly freely between various countries without seeking prior permission. Representatives of clubs also asked that the Private Pilot's Licence should carry with it permission for the holder to fly any private aircraft in the country which he may be visiting.

Another international regulation against which strong protests were made was the stipulation contained in Annex 1 to the Chicago Convention to the effect that pilots can exercise the privileges of a private licence only if they receive no remuneration. The Touring Committee considered this regulation unjust and decided that all member clubs should request their respective governments to have it annulled as soon as possible.



IN NO. 1 STYLE: From 1918, when the unit was equipped with S.E. 5as, it has been a tradition of No. 1 Squadron, R.A.F., to range its aircraft tail-to-tail. This latest photograph, specially posed for "Flight," shows the squadron's Meteor 8s. The pilots in the front row are :—

Sgts. J. V. Jones, F. J. Fry, M. A. Kinsey, R. J. Wilkins and P. Worden, F/O. W. E. Willis, F/Os. A. W. Forster and P. G. Sawyer, F/Lt. D. P. F. McCraig and R. W. Bunyan, A.F.C., S/L. J. L. W. Ellacombe, D.F.C. (Commanding Officer), F/Lt. R. J. S. Spooner and M. E. S. Evans, F/O. W. D. Dickinson, Sgt. R. L. Black, F/O. E. I. Pennington, F/O. D. J. Seward, Sgts. C. H. Maynard, E. H. Williams and B. H. Hallam.

SERVICE AVIATION *R.A.F. and Naval Aviation News*

Esher Trophy for No. 603 Squadron

PRINCESS ELIZABETH recently flew up to Leuchars in a Viking of the King's Flight to present the Esher Trophy to No. 603 (City of Edinburgh) Squadron. On arrival the Princess was received by Air Marshal Sir Basil Embry, A.O.C.-in-C. Fighter Command. She inspected on the parade ground No. 603 Squadron (S/L. P. J. Anson), No. 3603 F.C.U. (W/C. M. G. Pearson), and No. 2603 L.A.A. Squadron (F/L. J. Burgess *vice* S/L. Edwards).

Addressing the parade, Her Royal Highness spoke of No. 603's record in the war in these words :—

"I have read of your fame and the valiant part you played in the last war; of how in the Battle of Britain No. 603 Squadron fought in these skies to defend our homes and, when that victory was won, fought in the Mediterranean to keep inviolate the island fortress of Malta; and of how in Europe you bore your share in the great offensive that brought us final victory. I know, too, that many members of the City of Edinburgh Royal Air Force Regiment and the City of Edinburgh Fighter Control Unit saw much distinguished active service, and I am certain that the closest co-operation exists between all three units on parade here today.

"The squadron has a record second to none, and the great traditions of service which you built in the last war still inspire you today. You are giving freely of your spare time—which I know in these days to be a thing of great value—so that you may be always ready if we are ever again called upon to defend ourselves. That you are indeed ready is shown by the award of the Lord Esher trophy to No. 603 (City of Edinburgh) Squadron."

Referring to her recent appointment as Honorary Air Commodore to the Edinburgh R.Aux.A.F. units, the Princess concluded, "This trophy is given each year to the most efficient unit in the whole Royal Auxiliary Air Force, and I am very proud that at our first meeting it should be my privilege to present it to you. I do so now in the sure knowledge that you will always remain worthy of your great traditions."

R.A.F. Escaping Society

AIR MARSHAL SIR BASIL EMBRY, the chairman, is appealing for funds to help carry on the work of the R.A.F. Escaping Society, which was formed in 1946 to sustain the friendships between escapees and the people who risked their lives to help them.

Many of these people were tortured and eventually shot, or died in concentration camps. Among its activities, therefore, the society gives financial assistance to widows and orphans, and makes donations to charitable institutions in the countries concerned.

This year the Society is planning to bring parties of children to this country for holidays, but the scheme will have to be severely curtailed because of lack of funds. The Society's address is 83, Portland Place, London, W.1.

R.A.F. Recruiting

FIGURES issued by the Ministry of Defence, giving the total recruitment of men to all three Services for the second quarter of the year, show the R.A.F. to be top at 11,825. The Army are next highest with 5,631, and 2,699 entered the Royal Navy and Marines. The figure for the W.R.A.F., over the same period, is 1,071.

H.M.S. *Glory* Working Hard

THE cease-fire talks at Kaesong have had little effect on the day-to-day tasks of the 14th Carrier Air Group embarked in H.M.S. *Glory*, now operating in Korean waters.

Seasonal weather has increased the difficulties involved in supporting the ground forces but, despite low cloud, fog, and thunderstorms, some 600 sorties were flown during July—bringing the total number up to over the 2,000 mark.

To achieve these figures, the *Glory* has spent 70 per cent. of her time at sea and steamed nearly 25,000 miles.

AWARD FOR EFFICIENCY: S/L. P. J. Anson, Commanding Officer of No. 603 (City of Edinburgh) Squadron, comes forward to receive the Esher Trophy from the hands of Princess Elizabeth. The trophy is awarded annually to the most efficient R.Aux.A.F. squadron.

Korea Medal

HIS MAJESTY THE KING has approved a medal for British Commonwealth forces who have served in Korea. The qualifications required for members of Air Forces are :—one operational sortie over Korea or Korean waters, service of one day or more on land in Korea, or 28 days afloat in Korean waters.

Commemoration Service

A SERVICE of Thanksgiving for the victory achieved in the Battle of Britain in 1940 will be held in Westminster Abbey on Sunday, September 16th, at 3 p.m.

Applications for tickets for the service,

"Flight" photographs

A.T.C. AT WHITE WALTHAM: (Top left) Demonstrating the Eon Eton glider. (Top right) The contingent of 25 Canadian cadets now making an extensive tour of Britain. (Bottom left) Setting up the mountain rescue base. (Bottom right) Wrestling in the Cumberland style.

SERVICE AVIATION . . .

from widows and bereaved parents of Battle of Britain aircrew, and from retired R.A.F. officers and Battle of Britain pilots, should be sent to the Under-Secretary of State, Air Ministry (S.4(d)), Whitehall, S.W.1, in writing not later than September 3rd. In view of the strictly limited number of seats in the Abbey, the Air Ministry regrets that not more than two tickets can be issued to any applicant. Applications for tickets should not be sent to the Abbey authorities.

First Naval Attacker Squadron

ROYAL NAVAL AIR STATION FORD is to house No. 800, the new jet fighter squadron due to start forming on August 22nd.

Commanded by Lt. Cdr. G. C. Baldwin, the unit will have a front-line strength of eight Supermarine Attacker F.1s and will, in due course, be embarked in H.M.S. *Illustrious*; the same ship on which the prototype Attacker made its deck-landing trials in October, 1947.

No maximum-speed figure for the F.1 has been disclosed, but it will be remembered that "Mike" Lithgow, Vickers Supermarine chief test pilot, established a world's record with the prototype in February, 1948; over the 100 km closed circuit he clocked 564.881 m.p.h.

Bombing Competitions

TWO R.A.F. bomber crews, each of nine men from No. 3 Group, under the command of G/C. G. A. Walker, are in America to take part in the annual bombing and navigation competition at MacDill air base, Florida. They will fly in B-29s similar to those in service with the R.A.F.

In Britain the two squadrons left in the final for the Lawrence Minot Trophy are No. 7 and No. 617. No. 7 have won the trophy so many times that they almost consider it to be part of the squadron silver. Their usual rival is No. 58 Squadron, but this year it is No. 617, of Möhne and Eder dam fame.

New Air Torpedo Range

CONSIDERING the present range in Stokes Bay, Gosport, Hants, to be "unsuitable for testing the latest types of weapon," the Admiralty have decided to use a sea area of approximately five square miles off the south-west coast of Cornwall, near the Manacles. Constructional work will comprise the erection of two observation posts on the coast and alterations to the existing jetty in Polgwidden Cove.

A.T.C. Demonstration

HEADQUARTERS, HOME COMMAND, at White Waltham, was the venue last Saturday for a big Air Training Corps demonstration. Three hundred air cadets from all over the British Isles, Canada, India, Pakistan, Australia, Malaya, and America were assembled for the display which was attended by the Chief of Air Staff, Sir John Slessor, the A.O.C.-in-C., Home Command, Air Marshal Sir Robert Foster, and many other high ranking officers.

As with so many air events this year, bad weather was responsible for a curtailment in the programme. Heavy rain squalls made the boys' work doubly difficult; yet, soaked to the skin, they begged to be allowed to go on. The programme opened with the massed bands of No. 61 (Eastern) Group, and drill by members of No. 296 (Stoke Newington) Squadron.

Worthy of special mention was the mountain-rescue demonstration by cadets of No. 1855 (Royston) Squadron, No. 63 (Western and Welsh) Group. All the necessary equipment has been provided, or else "organized" by the boys themselves, including the motor cycles. The work is taken very seriously, and the team has already rescued two people from accidents in the mountains.

Despite low scud the glider display took place. The new Eon Eton primary trainer was bungy-launched, three Kirby Cadets were winched off in formation, and a Sedbergh which followed was quickly lost in the low cloud-base, to appear again shortly afterwards and perform aerobatics all the way down; a remarkable performance in the circumstances. The drum and pipe band of No. 67 (Northern Ireland) Group, under the direction of F/L. Beattie, received a well-earned ovation when they played through the tea interval. With their saffron kilts, green pipes and blue hackles in their berets, they looked exceedingly smart.

Following the Irish pipes was a drill demonstration by the American Civil Air Patrol cadets now visiting this country. To British eyes and ears the effect was a trifle theatrical, commands were given in a semi-musical manner while every so often the squad burst into song—led by a song leader in the centre of the formation. A British drill-book would not include many of the commands, but the whole effect was very entertaining.

Entirely different was a demonstration of Cumberland-style wrestling by cadets of 1247 (Penrith) Squadron, wearing traditional costumes. These boys put on an excellent show, showing in slow motion a number of typical "falls."

The best drill demonstration of the day was undoubtedly that given by the 25 cadets of the Air Cadet League of Canada, now touring the British Isles on an exchange basis. Of special note was their continuation drill (continuous changes of complicated formations without word of command).

The last item before abandonment of the meeting was a rehearsal by the Highland drum and pipe band and cadet-drill team before leaving to take part in the international drill competition, to be held in Toronto, Canada, at the end of this month. The Scottish pipes and full dress have charm and smartness that is all their own and those characteristics were shown to considerable advantage by these youngsters.

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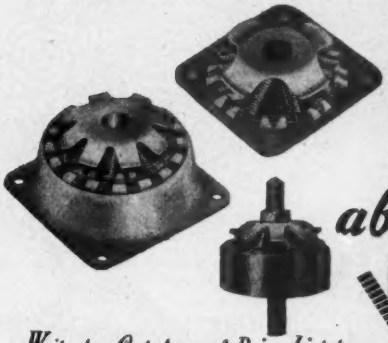

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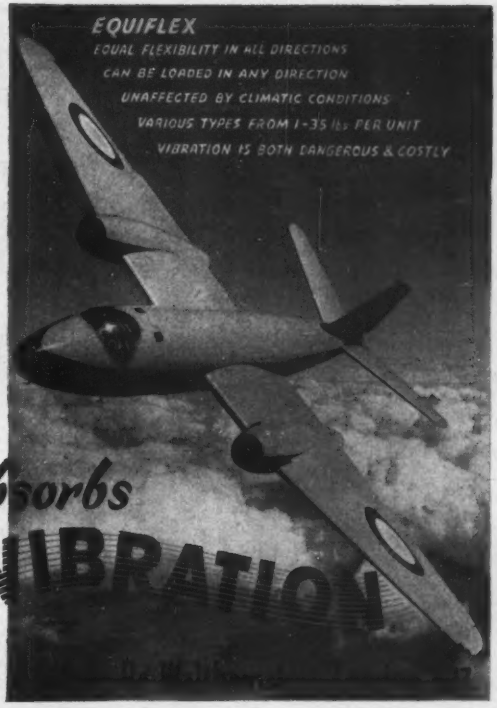
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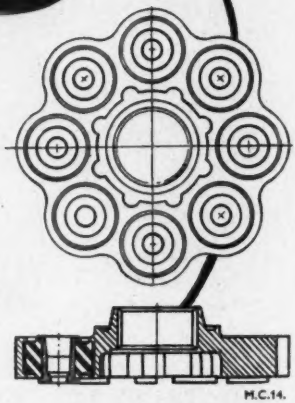

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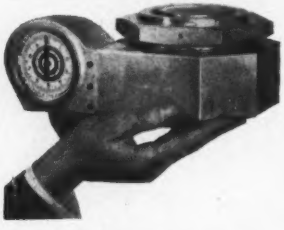

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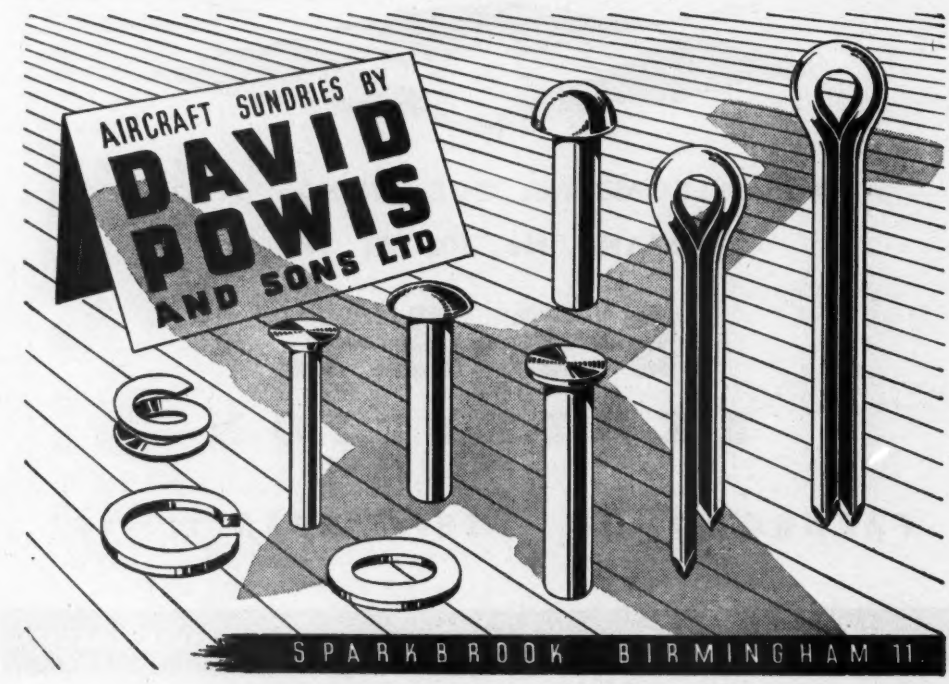

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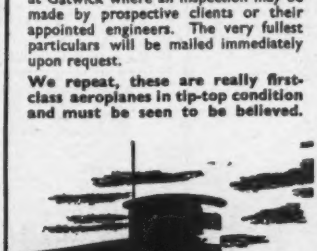

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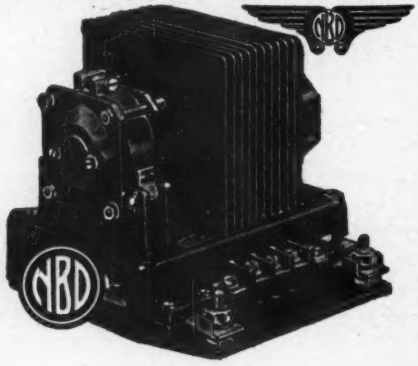

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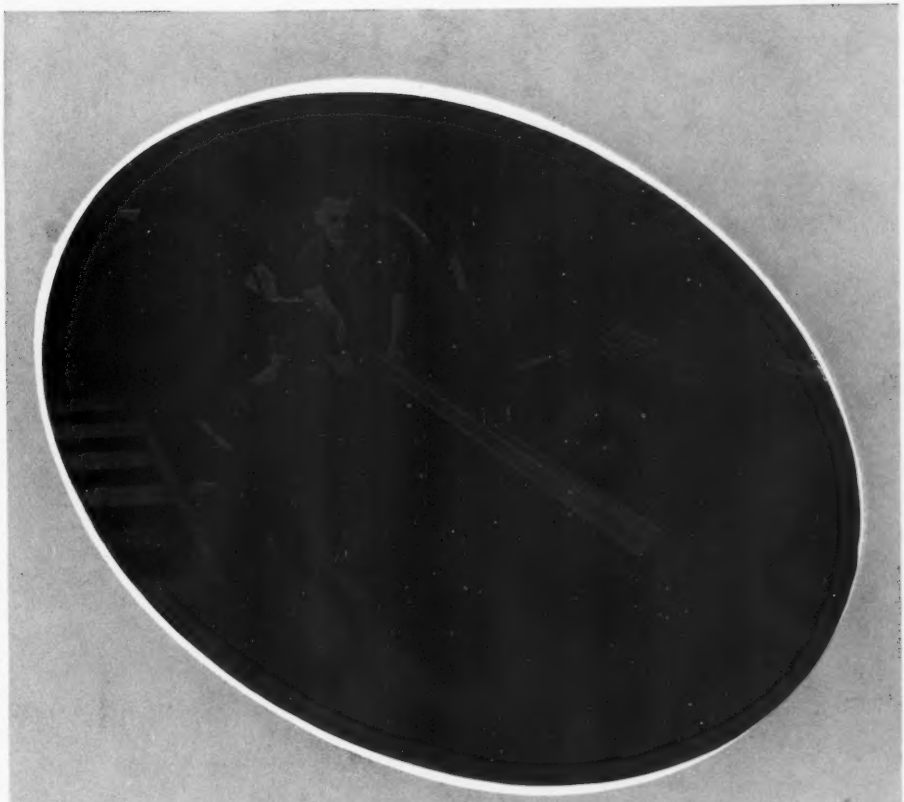

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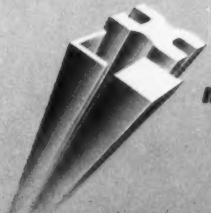

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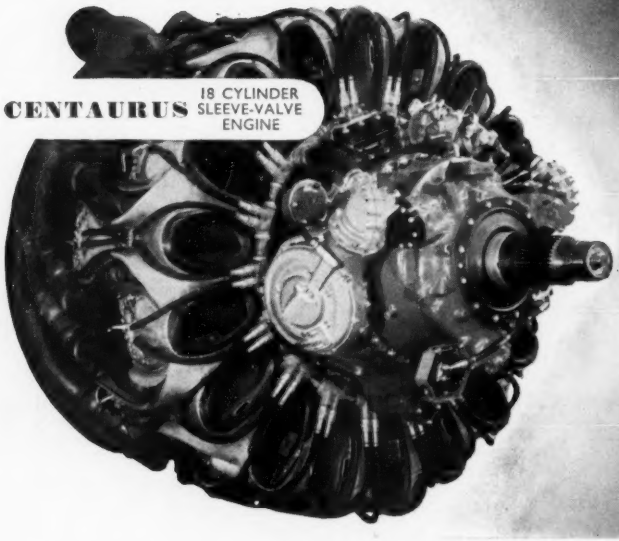

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